Vol. 9, No. 11

NOVEMBER, 1954

AGRICULTURAL CHEMICALS



Paul T. Truitt (left), president of the American Plant Food Council, and Russell Coleman, president of The National Fertilizer Association. The associations confirm plans for a Consolidation. (See p. 82).

In This Issue:

Commercial Use of Plant Nutrients • Pesticide Application Equipment • Regulations on Pesticide-Fertilizer Combinations California Agricultural Experiment Station • Iron Chelates for Iron Chlorosis • Ryania for Fly Control • Fertilizer and Pesticide Control Officials Meet • Pesticide Tolerances Issued



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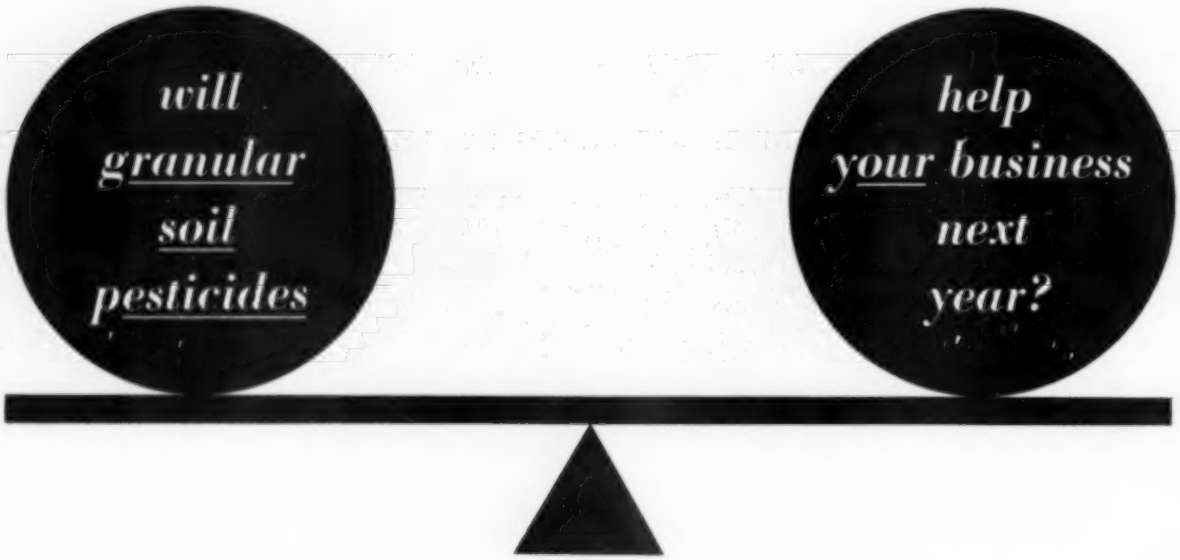
Thanksgiving

This great American tradition gives time to gather with family and friends with thanksgiving for the past and hope in the future.

When looking ahead, one thought worth considering is: What the future has in store for all of us depends in large measure on what we place in store for the future.

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AGRICULTURAL CHEMICALS



This Month's Cover

Paul T. Truitt, president of the American Plant Food Council, and Russell Coleman, president of the National Fertilizer Association, confirm that negotiations are being conducted to consolidate the two organizations into the NATIONAL PLANT FOOD INSTITUTE.

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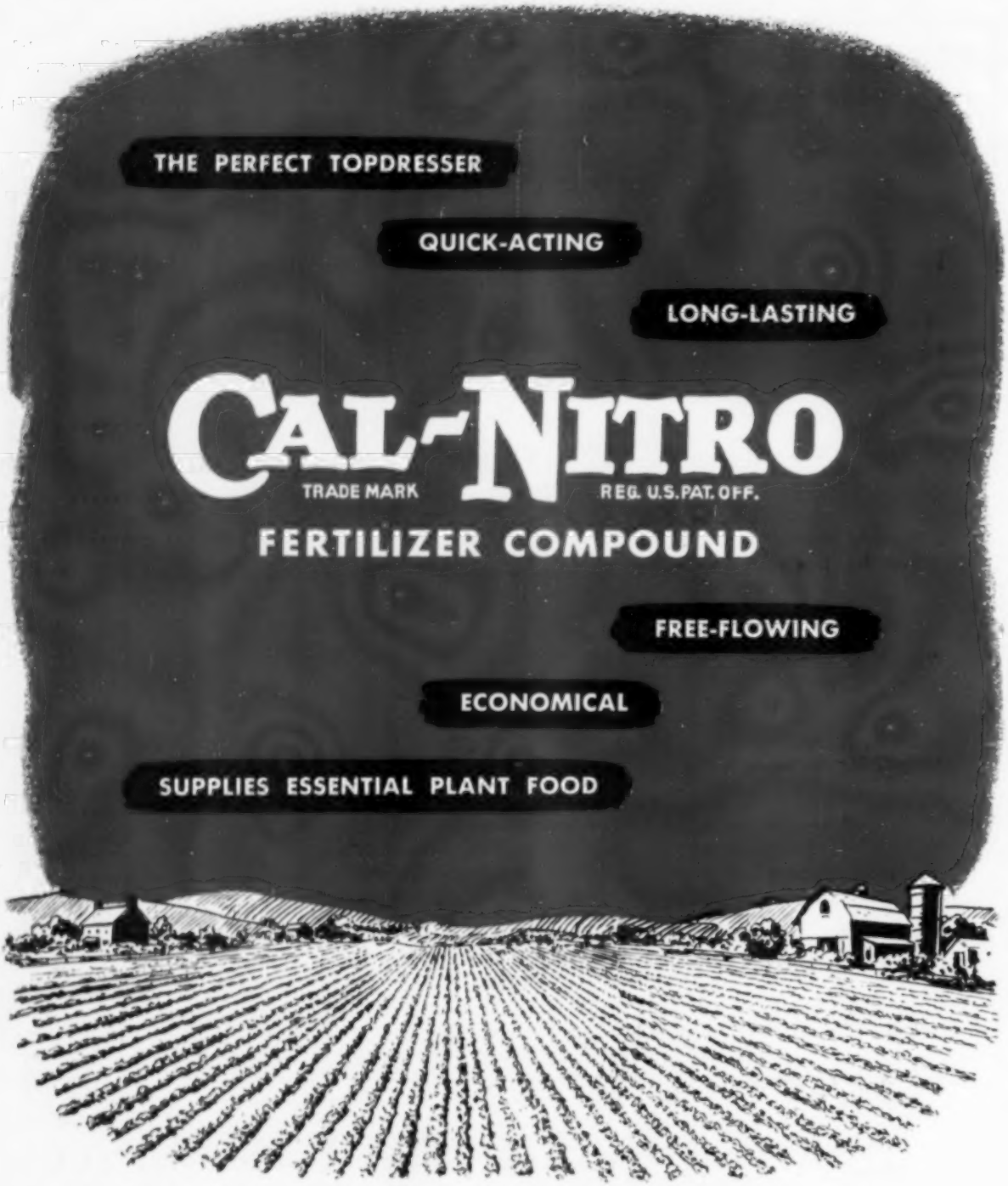
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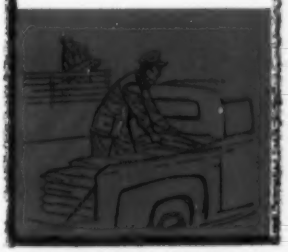
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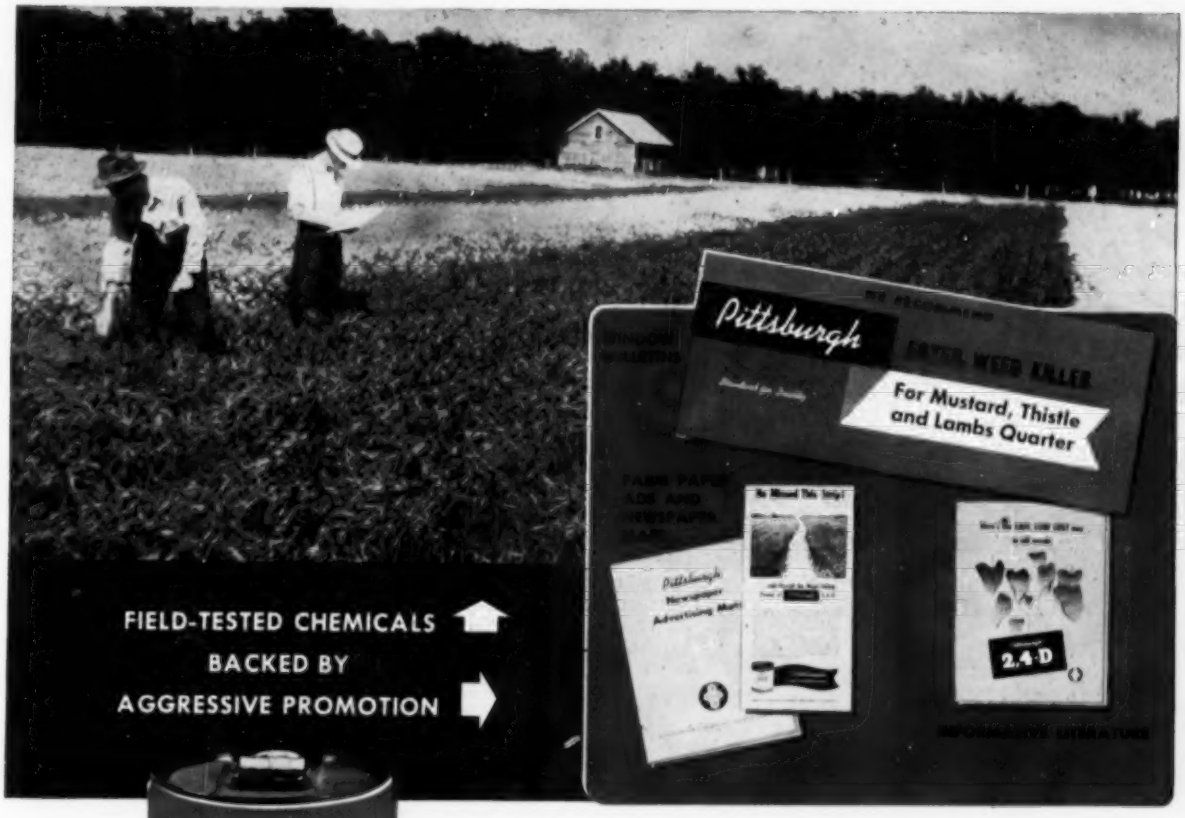
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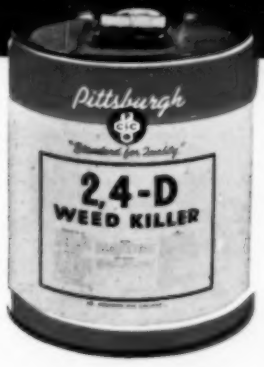
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Meeting Calendar

Nov. 8-12—American Society of Agronomy, St. Paul Hotel, St. Paul, Minn.

Nov. 9-11—16th Annual New York State Insecticide-Fungicide Conference, Ithaca, N. Y.

Nov. 10-12—National Fertilizer Assoc., Hollywood, Fla.

Nov. 13-17 — 9th annual meeting, Soil Conservation Society of America, Jacksonville, Fla.

Nov. 15-16—Eastern Branch, E.S.A., Hotel New Yorker, New York City.

Nov. 15-16—California Fertilizer Association, del Coronado Hotel, Coronado, Cal.

Nov. 17-18 — Ohio Pesticide Institute, Neil House, Columbus, O.

Nov. 18—Pesticide Dealers Conference, Rutgers Univ., New Brunswick, N. J.

Nov. 18-19—South Carolina Accident Prevention Conference, Fertilizer Section, Spartansburg, S. C.

Nov. 19—Ohio Fertilizer Conference, State Office Building, Columbus, O.

Nov. 29-30—Indiana Fertilizer Conference, Memorial Union Building, Purdue Univ., Lafayette, Ind.

Dec. 1-3—Wyoming Weed and Pest Conference, Agricultural Building, Univ. of Wyoming, Laramie.

Dec. 2-3 — Beltwide Cotton Insect Control Conference, Adolphus Hotel, Dallas, Tex.

Dec. 5-8—Agricultural Ammonia Institute, Jung Hotel, New Orleans.

Dec. 6-9—Entomological Society of America, Rice Hotel, Houston, Tex.

Dec. 6-9—N. Cent. Weed Conference, Gardner Hotel, Fargo, N. D.

Dec. 7 — Executive Committee Meeting, Fertilizer Section, N.S.C., at Spencer Chemical Co., Memphis, Tenn.

Dec. 10-11—Utah State Horticultural Society, annual convention, Hotel Utah, Salt Lake City.

Jan. 4-5, 1955 — Pesticide School, N. Carolina St. College, Raleigh.

Jan. 9-12, 1955—Middle States Garden Supply Show, Hotel Sherman, Chicago.

Jan. 17-19, 1955 — Cotton States Branch, E.S.A., Tampa Terrace Hotel, Tampa, Fla.

Jan. 31-Feb. 3, 1955—Eastern States Garden Suply Show, 71st Infantry Regiment Armory, New York.

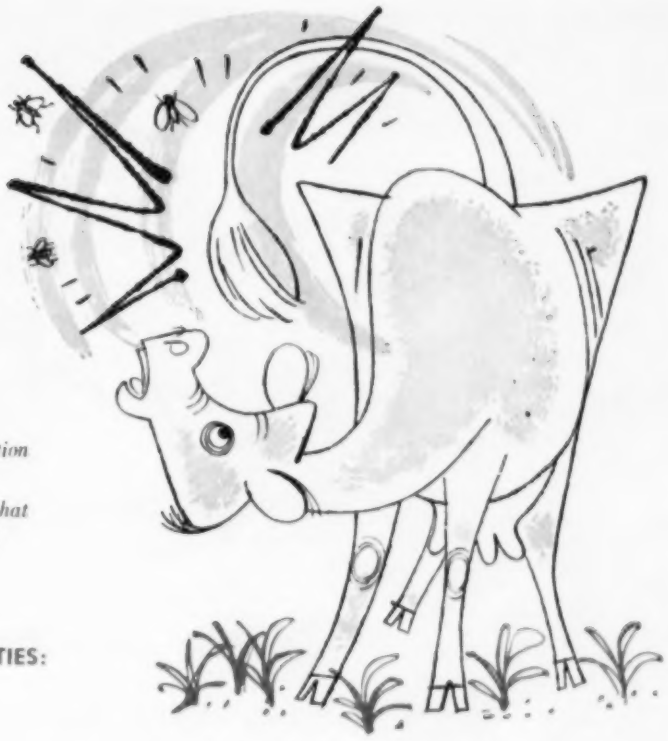
Feb. 23-25—Use of Aerial Equipment in Agriculture, 4th Annual conference, Purdue Univ., Lafayette, Ind.

March 7-9, 1955 — National Agricultural Chemicals Assoc., Spring Meeting, Chase & Park Plaza Hotel, St. Louis, Mo.

Mar. 24-25—N. Cent. States Branch, E.S.A., East Lansing, Mich.

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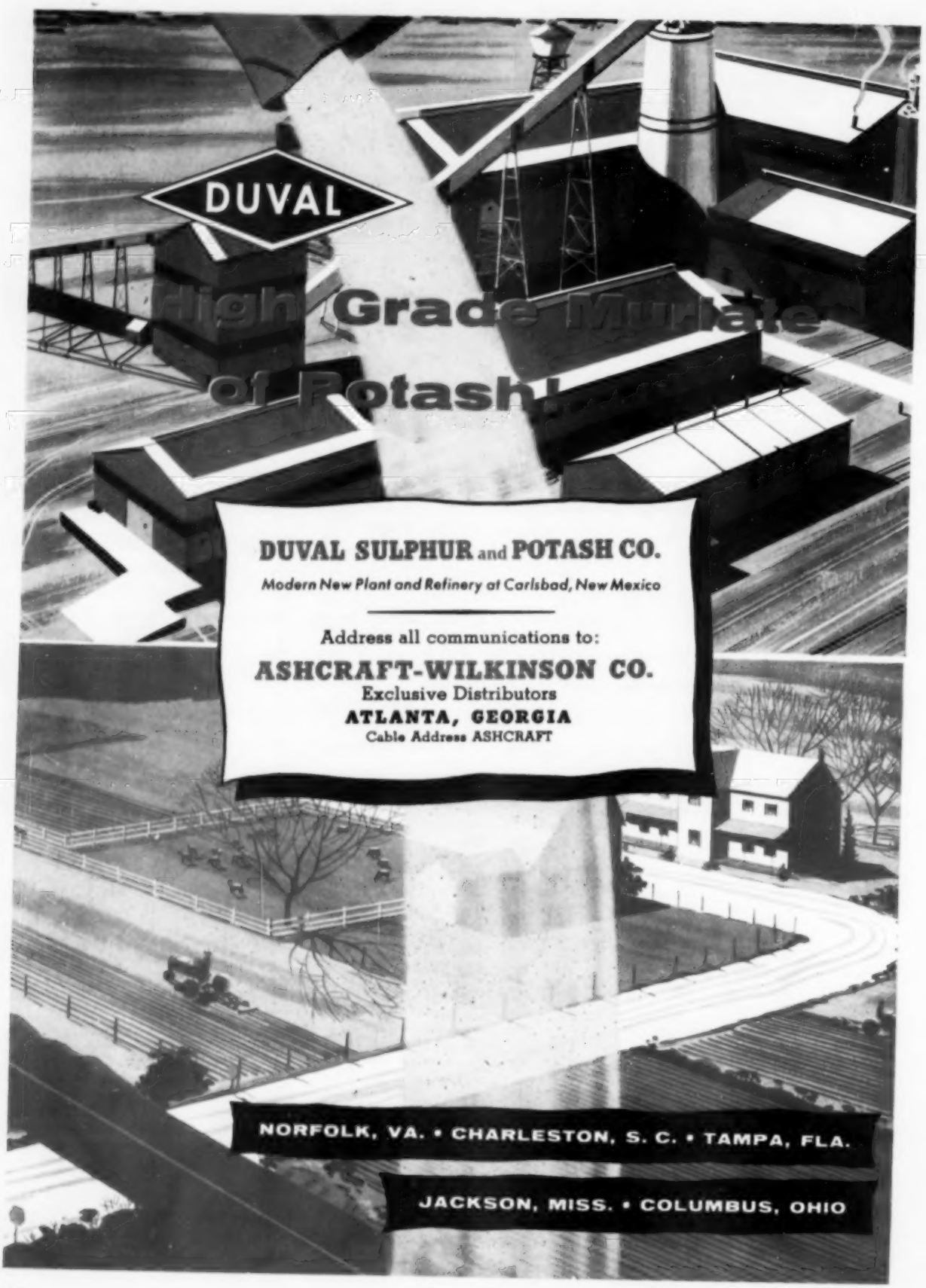
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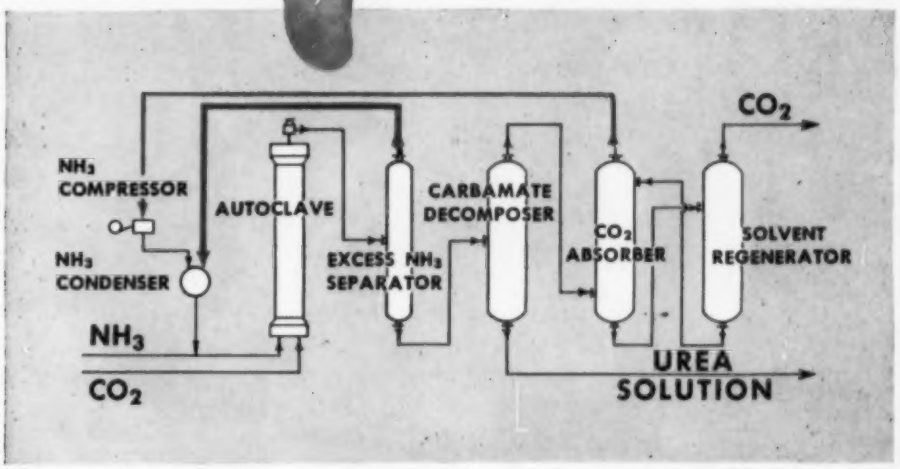
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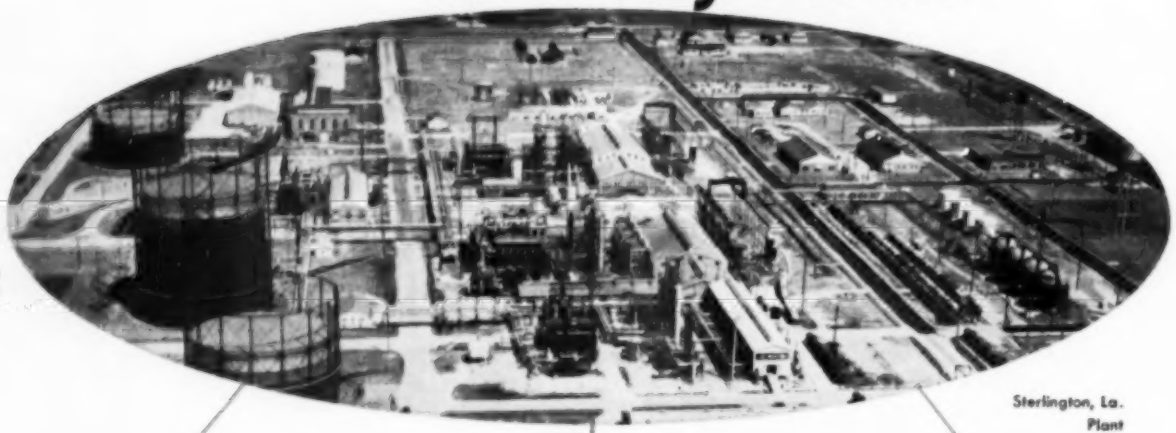
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NFA-APFC Consolidation

Members of the board of directors of the American Plant Food Council, Inc., meeting in Washington, D. C., Oct. 28 voted to recommend to the membership a proposal for Consolidation with The National Fertilizer Association to form a new, non-profit corporation to be known as the National Plant Food Institute.

The board of directors of The National Fertilizer Association meeting on October 19 voted approval of the consolidation subject to ratification by the association membership at a meeting to be held in Hollywood, Florida, November 10-12.

The proposal for consolidation will be submitted to the Council Membership at a special meeting to be held in Washington on December 1.

Should the members of both trade associations approve the consolidation, the National Plant Food Institute would be created as of July 1, 1955.

A 36-member board of directors would constitute the governing body of the institute and an interim "Work Committee" would be named to work out details of the operating program effective on the date of the consolidation.

The proposal of consolidation, as approved by the boards of directors of the two trade associations, was based on the recommendations of a joint committee of the two associations which met in Washington on October 4.

•

Anderson Heads Canadians

The second annual meeting of the Canadian Agricultural Chemicals Association was held at the Seignior Club, P.Q., Canada, October 27-29. M. F. Anderson of Naugatuck Chemicals, Division Dominion Rubber Co., Ltd., Montreal, was elected president of the association, succeeding A. Carter, Sherwin Williams of Canada. R. G. Smith, Charles Albert Smith, Ltd., was elected 1st vice pres.; E. P. Aikman, The Nichols Chemical Co., Ltd., Montreal, was elected 2nd v. pres.; K. B. Owens, Monsanto (Canada) Ltd., secretary; M. E. Ward, duPont Canada Ltd., treasurer, and J. H. Elliot, Rohm & Haas Co. of Canada, Ltd., was elected director.

At a meeting of the technical section, H. Pass, Sherwin Williams, Montreal, was named new chairman of the section, succeeding J. H. Follwell; the vice-chairman is A. W. Lougheed, Naugatuck Chemical; and secretary is D. K. Jackson, Monsanto (Canada) Ltd.

At its meeting, the technical section discussed a Canadian counterpart to the Miller Bill, ie the Canadian government's proposal regarding the establishment of tolerances. A subcommittee was named to give further consideration to the subject. Other program details are carried on page 89. A full account of the sessions will be reviewed next month in *Agricultural Chemicals*.

•

American Potash Names Pinigis

Edwin J. Pinigis recently joined the agricultural chemicals division of American Potash & Chemical Corp., Los Angeles, as technical service representative. Mr. Pinigis formerly was with the agricultural chemicals division of the Pittsburgh Coke and Chemical Co. He will work on formulation and application of agricultural chemicals.

•

Cotton Conf. Dec. 2, 3

Entomologists from every cotton growing state will meet December 2 and 3 in Dallas, Texas, to take a long look at their insect fighting activities during 1954 and plan new tactics for next year. The eighth annual Beltwide Cotton Insect Control Conference will convene at Hotel Adolphus in Dallas.

Also present will be a number of farm organization and cotton industry leaders, along with representatives from more than 100 commercial chemical companies, application equipment manufacturers, and commercial applicators. Conferees will hear reports on progress, review current problems, and discuss opportunities for improving the effectiveness of cotton insect control programs in each state.

Spotlighted on this year's agenda is a panel discussion on utilizing press, radio and television in controlling insects. Top press and radio representatives will be on the panel with entomologists. Recent developments in research on the pink bollworm—today's biggest new insect threat to cotton — will be reviewed by Dr. F. C. Bishopp, who is in charge of the cooperative pink bollworm project at Brownsville, Texas. Approximately 500 are expected to attend.

•

New Anti-Breakdown Agent

A new agent which prevents decomposition of an insecticide by its carrier has been developed by Velsicol Corp., Chicago, according to J. F. Kirk, vice president and director of sales. The new product was developed for use with heptachlor dust and granulated formulations.

According to Mr. Kirk, many types of clay used commonly as carriers and diluents for organic insecticides are active catalysts which decompose heptachlor and certain other chlorinated hydrocarbon insecticides. To prevent this decomposition and stabilize the formulation, urea, hexamethylene tetramine and several other chemicals have been used as catalyst deactivators. The Velsicol development is a new type of "catalyst deactivator" reported to be more efficient, economical and easier to use than previous stabilizers. A patent application has been filed.

•

NFA Plant Food Book

The Care and Feeding of Garden Plants a new book for the home gardener, will be off the press and available November 10th. It was prepared under the sponsorship of the American Society for Horticultural Science and The National Fertilizer Association.

It is the first book of its kind to acquaint the home gardener with hunger signs as they reveal themselves in common garden plants. The book stresses proper diets and, in particular, what makes plants grow.

Specially prepared color illustrations make it easy to identify plant nutritional deficiency symptoms. Subjects in the new book include lawns, shrubs, trees, house plants, fertilizers for garden flowers, the vegetable garden, small fruits, and a physiology and soils section which has been reduced to laymen's terms for simplicity. It contains some 300 pages, and is available through the NFA, 616 Investment Bldg., Washington, D. C., at $3.00 postpaid.

•

GLF Plans Fertilizer Plant

The Cooperative Grange League Federation plans to erect a new $800,000 fertilizer plant at Big Flats, N.Y., it was announced at the group's annual convention by Charles N. Silcox, general manager of G.L.F. It was reported also that an appropriation has been recommended to install $60,000 worth of granulating equipment at the Lyons, N. Y. fertilizer plant.

Additional storage facilities are being added at Lyons and Batavia, N. Y., for added facilities for mixing, bagging, and bulk loading fertilizers. Another mixing unit is being built at Bridgeton, N. J.

•

Davison Names Reid

Lewis C. Reid has been named assistant sales manager of the industrial chemicals department, Davison Chemical Co. Div. of W. R. Grace & Co. Mr. Reid was formerly with Wyandotte Chemicals Corp., where he was Chicago district manager for the Michigan Alkali Division.

•

Irving to USDA Post

George W. Irving, Jr. was recently named deputy administrator in charge of research for the USDA. In this position Dr. Irving will coordinate investigations of the 16 branches, including many fields of agricultural science.

•

Japan Ships Fertilizer

Some 30,000 tons of superphosphate of lime will be shipped by Japanese fertilizer plants to Communist China, according to a report by the Kyodo news service. The fertilizer is collateral for 280,000 tons of salt imported from Red China from April through September.

New Ammonia Plant in Ind.

Sinclair & Refining Co., New York, and Standard Oil Co. of Indiana, Chicago, have just announced plans to form a joint company for the production of anhydrous ammonia solutions in Hammond, Ind. The plant will have a capacity of 300 tons per day, one-third of which will be used in the production of nitrogen solutions.

Adjacent to refineries of both Sinclair Refining and Standard Oil, the ammonia plant will use by-product hydrogen from catalytic refineries being built by both companies. Construction is scheduled to begin early next spring, with "on stream" production expected early in 1956.

•

Davis Joins Penn Indl.

Pennsylvania Industrial Chemical Corp., Clairton, Pa., announced the appointment of W. C. Davis as Detroit district manager on October 26th. Mr. Davis was formerly assistant sales manager for Monsanto Chemical Co., and prior to that had been associated with American Cyanamid Co.

•

Sunflower Contract Ends

Food Machinery and Chemical Corp., San Jose, California, and Wisconsin Alumni Research Foundation, Madison, Wisc., have announced that the Army Ordnance contract which provided for the construction and operation of a demonstration unit at Sunflower Ordnance Works, Kansas City, has been terminated.

The demonstration unit at Sunflower Ordnance Works was developed for the purpose of piloting on a large scale the Wisconsin process for nitrogen fixation. This process makes use of a high temperature pebble heat exchange furnace to produce dilute nitric oxide. During the period of operation, substantial tonnages of high grade nitric acid were produced and the structures proved their ability to take continuous operation at 4000°F.

A vast amount of vital data in respect to this field of technology was developed, but the economics for commercial production in the demonstration structures did not prove to be in line competitively with the other processes now being operated on a large and integrated scale in the United States.

To correct some of the technological difficulties encountered during the operation and to further develop the technology involved in the process, as well as to further test the economic factors, both laboratory and small pilot plant operations will be continued.

•

NFA Educational Films

At its annual fall meeting, (see page 69) The National Fertilizer Association plans to show two documentary films, "Weather or Not," and "The Big Test."

"Weather or Not" is a documentary produced by the NFA in cooperation with the Sprinkler Irrigation Association. It is designed to stimulate interest in irrigation in the humid areas of the United States.

Included in the story is information on irrigation, rates of fertilizer application, cultural practices, insect and weed control, etc., with a practical comparison with non irrigated pasture.

The second film "The Big Test," is constructed around a how-to-do-it theme which describes the advantages and methods of soil sampling. The script was written by Dr. J. W. Fitts, State Department of Agriculture, North Carolina. Soil testing as portrayed in this film was adapted from material supplied by the Soil Test Work Group of the National Soil Research Committee.

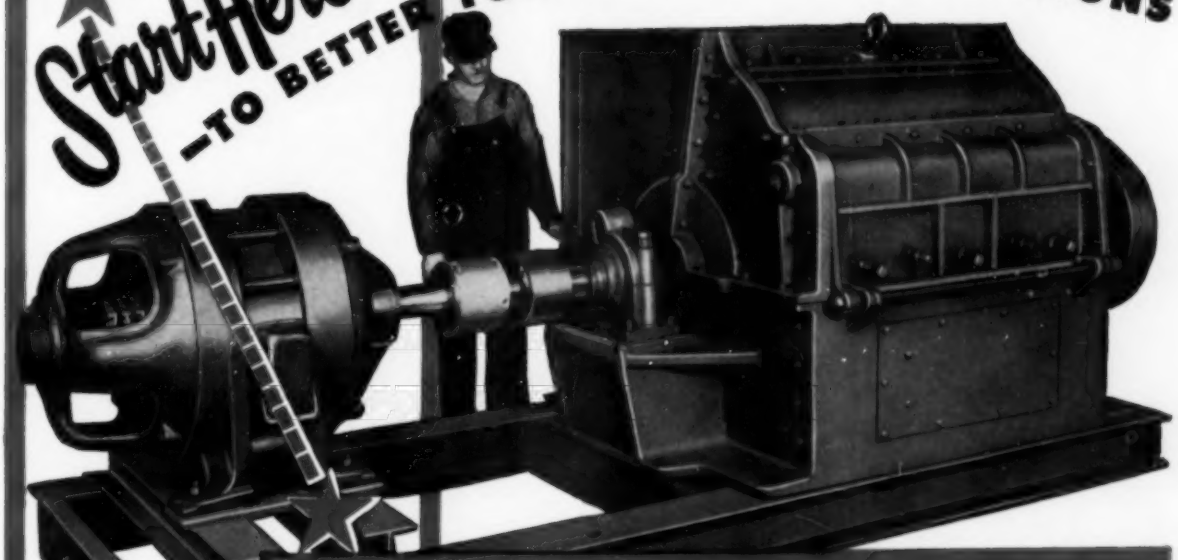
Discussed is the method of taking a soil sample: getting representative samples, mixing them properly, packaging, filling out data sheets, sending to soil testing laboratory, etc.

•

Minco Applications Described

Minco Products Corp., Saginaw, Mich., have offered a nine-page bulletin on the use and application of "Minco," a new product used in granulating fertilizer compounds. The physical and chemical properties of the product, reported to eliminate caking in pulverized fertilizer, are listed.

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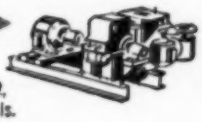


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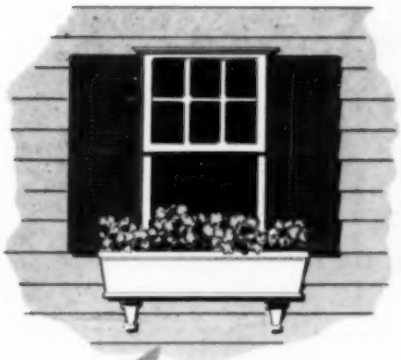
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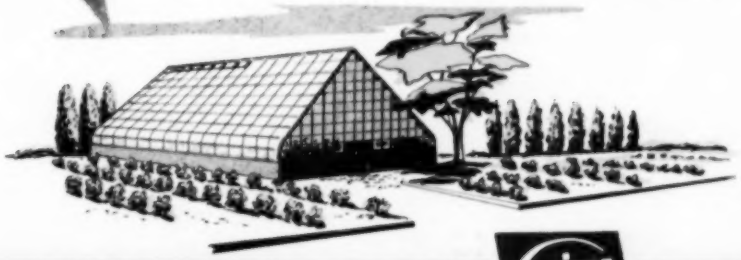
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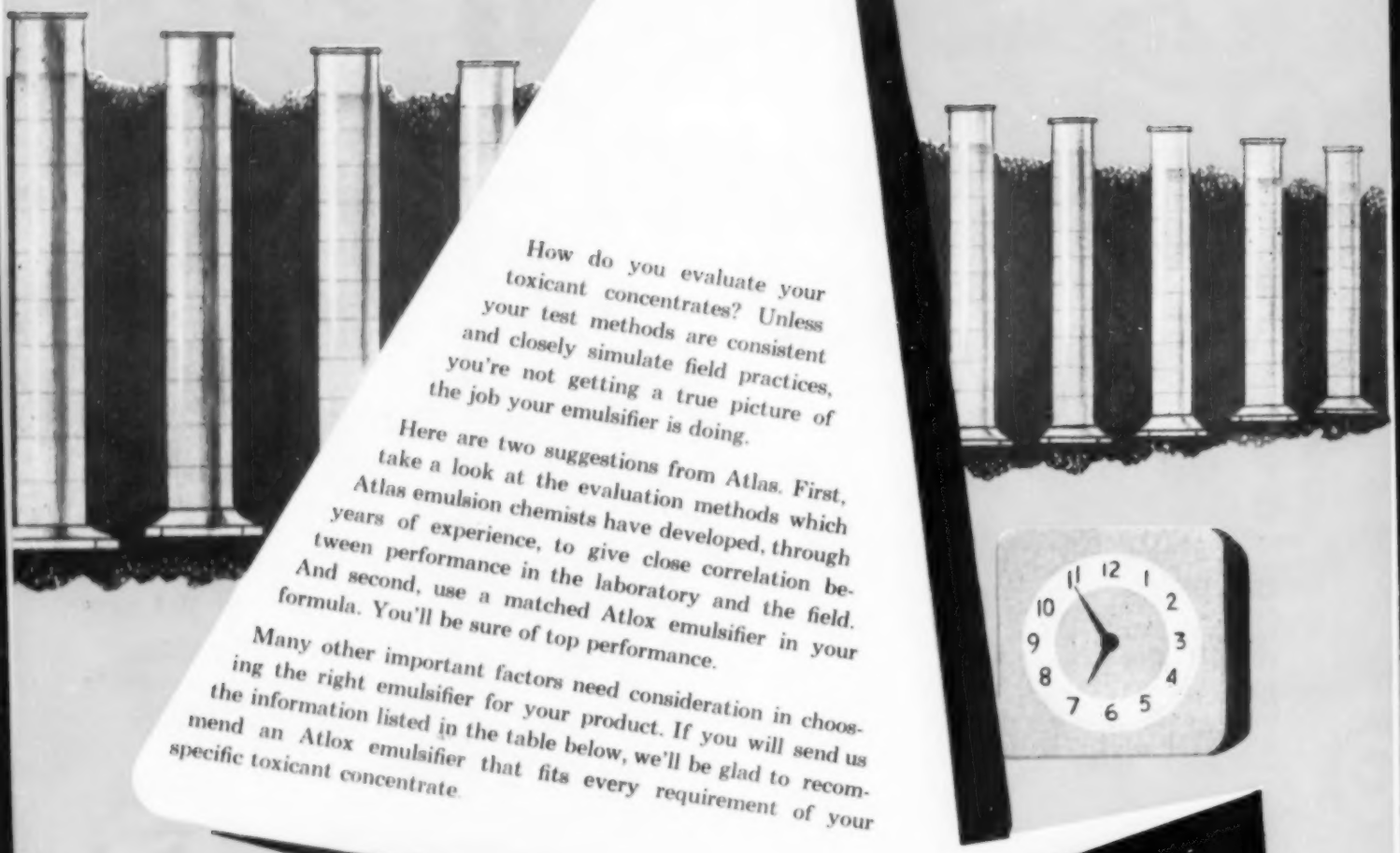
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EMULSION DATA CHECK LIST

1. Toxicant used _____
2. Solvent used _____
3. For water hardness _____ ppm.
4. Recommended dilution _____
5. Lbs. toxicant/gal. of concentrate _____
6. Desired emulsion stability _____
7. Shelf life period expected _____
8. Ease of dispersion important? _____
9. Packaging: bulk _____ or small container _____
10. How is concentrate mixed and evaluated in laboratory tests? _____

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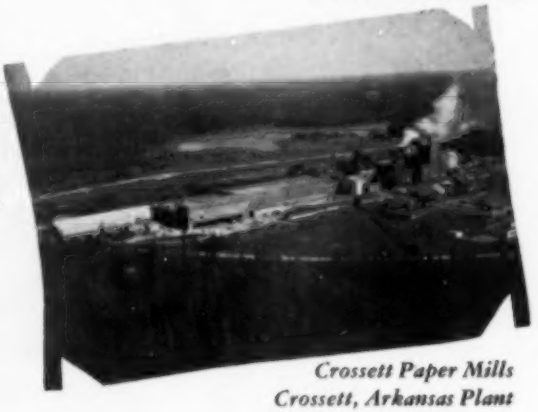
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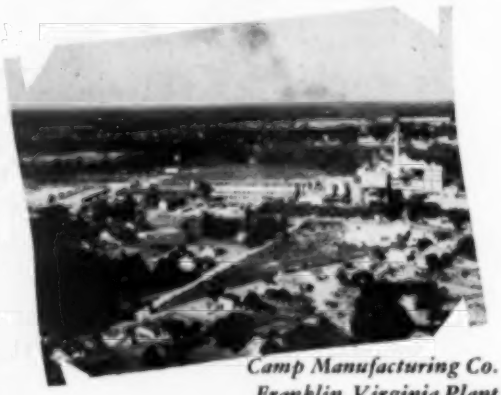
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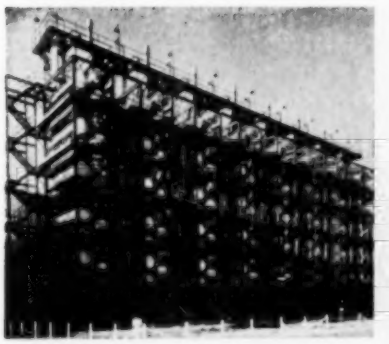
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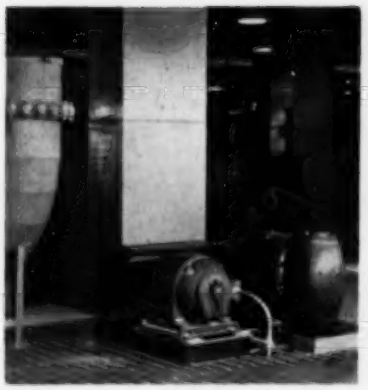
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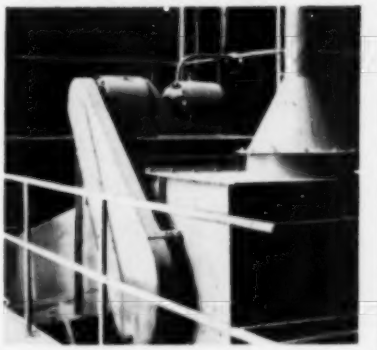
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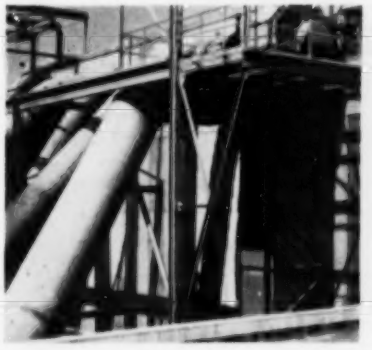
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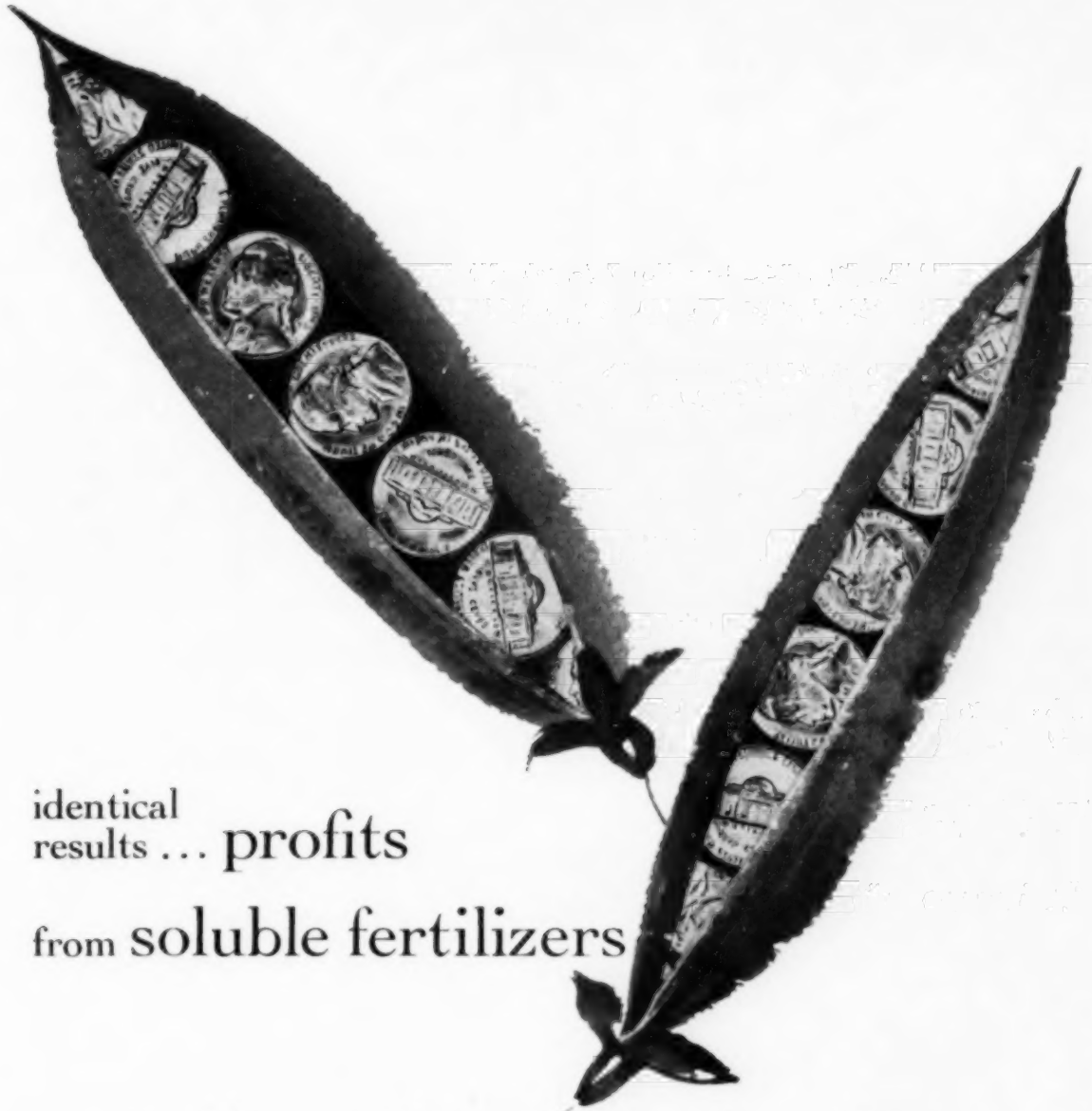
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Editorial
COMMENTS

THE recent joint announcement by the presidents of the two fertilizer associations, the American Plant Food Council and The National Fertilizer Association, that their two groups are considering plans for consolidation, to form a new organization, the National Plant Food Institute, has been greeted with enthusiasm in the fertilizer industry, with widely expressed hope for early ratification of the proposed consolidation by the membership of both organizations.

In appraising this important development it should be kept in mind that, this is planned to be in every sense a true consolidation. Leaders of the industry are determined to carry forward the progressive activities and programs of *both* trade groups. It has taken years of patient study and negotiation to reach this desired end result, and the leaders of the fertilizer industry who have carried the work this far are to be highly commended. Perhaps we can shortly anticipate hearing a single and stronger voice for the entire fertilizer industry.

* * * * *

ISSUANCE by the U. S. Food and Drug Administration of the long awaited tolerances for pesticide residues has been received with a mixed response by the pesticide industry. (For details of the tolerances see story pp 60-61). With four years having elapsed since testimony was taken in the lengthy Washington hearings, it was inevitable of course that when the tolerances were finally announced they would immediately be years out of date. This could logically have been anticipated.

The results of recent research work are not reflected in the tolerance schedules. Newer materials are not covered on a realistic basis. By law, Food and Drug was required to base its rulings on data established at the 1950 hearings. Thus the industry now faces the new job of bringing the tolerances up to date. Applications may be filed under the procedure set down in the Miller amendment to establish tolerances for new pesticides, or to revise present tolerances where more recent data has shown revision is indicated. And, let us hope, now that the framework has been set up, action will be speedier on applications for revision than it was on the initial schedules.

The only other point on which we foresee any serious industry complaint is in the matter of fees. A fee of $500 for a new tolerance looks high to this observer. This is definitely not a wealthy industry, and we see in such a high fee level a serious financial impediment at least to the smaller firms in the pesticide field. And while we are heartily in sympathy with a pay-as-you-go basis in government, we hope that before final decision is made on this point that serious consideration may be given to revising the suggested rates.



FIGURE 1

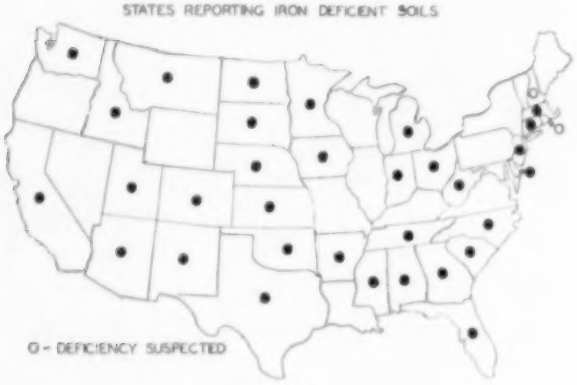


FIGURE 2



FIGURE 3

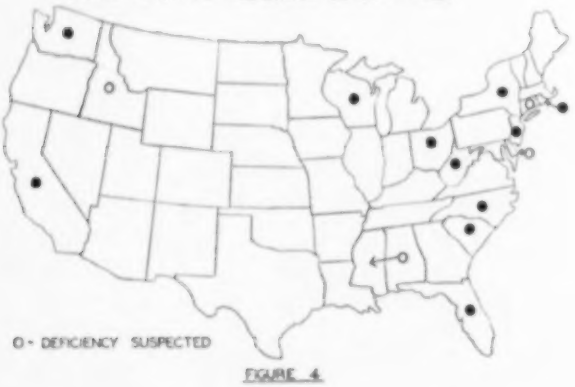


FIGURE 4

Commercial Use And Importance

ALL five of the heavy metal plant nutrients were employed as soil amendments before their essentiality to normal plant growth was established. Manganese salts were being used as early as 1909 to correct the physiological disturbance in oats known as "grey speck." Javiller, in 1912, recommended the use of zinc salts as a fertilizer for corn. In 1917, Floyd advised the use of copper sulfate to correct "dieback" of citrus, and the response of several legumes to applied salts of molybdenum was noted in 1937. All of these reports predate our knowledge of the essential nature of the elements concerned.

Since iron was the second, or third, mineral element to be established as essential to plants, information as to its earliest use in agriculture is lost in antiquity.

Although these early reports of the use of heavy metal nutrients in agriculture are of historical interest, the major developments in this field have occurred during the past 30 years.

The amounts of copper, manganese and zinc now used in this country each year as plant nutrients are reported in terms of thousands of tons of their oxides. Salts of iron and molybdenum are being used in smaller but increasing amounts as new areas of soils deficient in one or the other of these nutrients are uncovered by research.

The entry of chelates into the agricultural field has reawakened interest in studies of the role of iron

of Heavy Plant Nutrients

By E. R. Purvis
Rutgers University
New Brunswick, N. J.

in plant nutrition, and has already resulted in the establishment of areas of iron-deficient soils where the deficiency was not suspected as late as three years ago.

The increasing importance of the heavy metal plant nutrients to American agriculture is illustrated in figures 1, 2, 3, 4, and 5, which indicate the states in which are found areas of soils deficient in one or more of these elements. The maps summarize information obtained from correspondence with staff members of the various state agricultural experiment stations, as indicated in Table 2, page 131.

Use of Copper on Mineral Soils

COPPER salts were first used on an etxensive scale in this country in the Everglades, following the work of Allison, Bryan, and Hunter, published in 1927. These investigators reported that virtually all of the 59 crops tested on the raw peat soils of that area responded to applied copper sulfate. Later work in other areas confirmed these findings, and today copper deficiency is a recognized problem in peat soils throughout the country. However, the deficiency is not confined to organic soils. Response to applied copper on mineral soils has been reported from such widely separated areas as Arkansas, California, Florida, Nebraska and New York.

All plants appear to be affected, in varying degree, by copper deficiency. Citrus, vegetables, various pasture grasses, small grains and sugar cane are among the major crops to which copper salts are now being applied. Florida, New York, Indiana, and California are among the leading states in the use of copper as a plant nutrient, with Florida using more than all other states combined.

Copper sulfate is the salt used most commonly to supply the nutrient to deficient crops and soils. It is used either as a foliar spray or as a soil amendment. Rates of application vary from 2 to 5 pounds of copper sulfate per acre as a foliar spray, to from 10 to 200 pounds of the salt per acre as a soil amendment, the higher rates being applied to organic soils.

Recent research in Florida has found copper accumulation of as much as 600 pounds to the acre in citrus soils as a result of repeated small annual applications. Recommendations from this state now call for the omission of copper in the fertilizer for old groves that have received applications of the nutrient in recent years, and for all groves which receive copper sulfate spray for melanose or scab control. These findings will result in a considerable reduction in the amount of copper salts applied as plant nutrients in Florida.

Iron Deficiency in Soil

AS already mentioned, iron deficiency in plants has been known for over a century. Until recently, it was believed that the deficiency was confined to alkaline or overlimed soils, although Lipman and his associates reported growth response of corn, wheat, oats and timothy to applications of ferrous sulfate on acid soil as early as 1912. No mention was made of plant symptoms in the untreated plots and for some reason this work was not continued.

Since 32 states report known or suspected instances of iron deficiency, it is evident that this is the most widely occurring of all heavy metal nutrient deficiencies. Evidence of response to applied iron salts by crops growing on normal soils, and without any apparent deficiency symptoms, has been noted in New Jersey during the past two years. This raises the possibility that many unsuspected soils and crops are suffering from a limited deficiency of iron.

Various methods have been employed in the treatment of iron de-

EDITOR'S NOTE: The application of trace elements to mineral-deficient soils has produced startling results in crop yields which could encourage indiscriminate use of the plant nutrients and the consequent danger of lack of confidence of the farmers in the use of these elements in a fertilization program. Continual cropping without returning sufficient trace elements to the soil has exhaused certain lands of specific elements; other areas, of course, have always been lacking in certain nutrients, essential to plant life. Other lands, by contrast, possess adequate reservoirs of the essential trace elements, and applying additional amounts would be pointless. The first question, then, is an analysis of what elements are needed in specific soils, before recommending to the farmer that he apply one or more of the plant nutrients to his farmland.

In view of the increased interest in this phase of agricultural, AGRICULTURAL CHEMICALS is publishing a series of articles offering the latest information on the plant nutrients. The September edition opened the series with the story of Molybdenum (September, 1954, pp. 42-45). This month, Dr. E. R. Purvis presents a general picture of the commercial use and importance of the heavy metal nutrients (see pp. 36-38), while the use and application of the iron chelates appears on pages 47-49 of this edition.

In future issues, the series will be continued with coverage of elements, such as chlorine and vanadium, application of which to the soil is relatively new, and an up-to-date evaluation of boron.

Just as the airplane has broadened horizons and shown fascinating possibilities for progress in the agricultural economy, so the trace elements may offer a key to better utilization of our lands.

*Presented at AIBS meeting, Gainesville, Fla., Sept. 6-7, 1954.

fiency. These include the injection of iron salts into the trunks of trees, foliar spraying with dilute solutions of iron salts, soil treatment with various iron salts, and the acidification of soils with sulfur. Salts employed include the sulfate, citrate and tartrate of iron, and, more recently, the various chelate complexes. Rates of application vary from dilute sprays containing one per cent or less of the iron salt to over 100 pounds to the acre of the salt when applied as a soil amendment. Chelated iron has been found effective at rates of from 25 to 75 pounds of the complex to the acre when applied to the soil. Foliar application of chelated iron has not been effective in most instances.

Manganese Deficiency in 22 States

REPORTS of manganese deficiency have come from 22 states. In general, this deficiency is confined to overlimed soils of the east and alkaline soils of the west. A few instances of manganese deficiency have been noted on light textured acid soils.

Gilbert and McLean of the Rhode Island Stations were probably the first to report a significant acreage of manganese deficient soils in this country. Their work was reported in 1925 and solved one of the problems created by an over-enthusiastic liming program. Two years later, Allison and his associates found manganese almost as important as copper in the treatment of alkaline soils of the Florida Everglades.

Instances of manganese deficiency have been reported in almost all crops grown in this country. However, it is likely that vegetable crops receive the major portion of the element used in agriculture today.

Manganese sulfate is the principal salt employed in the correction of manganese deficiency. It is applied either as a foliar spray or as a soil amendment. Rates of application vary from sprays containing from 0.2 to 0.5 per cent of the salt, to soil applications of 200 pounds to the acre. Soil applications are ineffective on some soils of high lime content and here the foliar sprays must be used. Once the deficiency develops in a soil, annual treatment is required until the pH is reduced to approximately 6.5. The use of sulfur is sometimes resorted to for this purpose.

Molybdenum

MOLYBDENUM is the latest element to be added to the list of nutrients known to be essential to plants. The first reports of molybdenum deficient soils in this country came from California in 1948 and New Jersey in 1950. In the past 4 years, deficiencies of this nutrient have been reported from 9 additional states and are suspected in 4 others.

Twelve crops have been reported to be affected by molybdenum deficiency, with citrus, alfalfa and cauliflower being the more important with respect to acreage concerned. The largest area of known deficient soils is in Florida where it is estimated that from 25 to 50 per cent of the citrus acreage may be affected.

In most instances, molybdenum deficiency is found on acid soils where the element is fixed in an unavailable state. However, it may also occur on slightly acid or alkaline soils as a result of the available supply being exhausted by plant use, or by leaching.

Both ammonium and sodium molybdates have proved satisfactory for correcting molybdenum deficiency. These salts may be applied to the soil or sprayed upon foliage. Rates of application vary from 2 ounces to 1 pound to the acre. A satisfactory method for treating legumes is to mix two ounces of the salt with 10 pounds of seed just prior to planting.

Zinc Applications to Soil

AREAS of known or suspected zinc deficient soils have been reported from 26 states. Some 41 crops have been reported to be affected by the deficiency. The tier of states running across the southern boundary of the country from Florida to California appear to be affected most seriously. In this area, such important crops as citrus, tung, pecans, deciduous fruits, peanuts, cotton, corn and a wide variety of vegetables receive annual applications of zinc salts.

Zinc deficiency usually occurs on weakly acid or alkaline soils and becomes progressively worse as the pH increases above 6.0. Soil applications of zinc sulfate of from 20 to 40 pounds to the acre are often effective on slightly acid soils but become ineffective when the pH rises above 7.0. In the alkaline range, foliar sprays or trunk injections are necessary to get the zinc into the plant. Three pounds of zinc sulfate to 100 gallons of water gives a satisfactory spray solution.

Future Requirements for Nutrients

IT appears inevitable that the heavy metal nutrients will become of increasing importance to agriculture in the future. Although virtually all soils contain sufficient total amounts of these nutrients for hundreds of crops, new deficiency areas will develop as more soils are depleted of their available supply of these elements. Eventually all of these nu-

(*Continued on Page 129*)

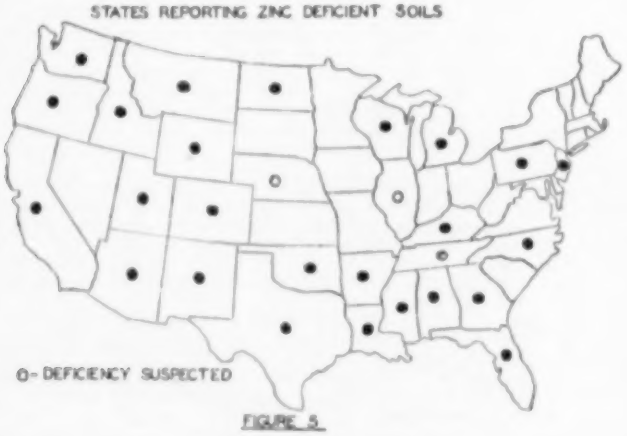


FIGURE 5

Effect of Pesticides on Application Equipment

By J. Kelly and W. Falkenstein

Dow Chemical Co.
Midland, Michigan

IN recent years, increased attention has been given to the effect of pesticides on application equipment. This is due to the increasingly complex situation found in agriculture today where each month seemingly finds another new product available to the grower.

Early in 1949, a group of representatives from the equipment and chemical industries known as the Pesticide and Application Equipment Committee met to study this problem. It was recognized that millions of pounds of DDT, BHC, 2,4-D and other chemicals had been used with great success since the introduction of the halogenated hydrocarbon toxicants, but evidence was available to show that new problems in equipment deterioration were cropping up. Accordingly, a subcommittee was appointed to study the effect of pesticides on application equipment. The subcommittee recommended establishment of a project with a full time leader in order to more clearly define the problem. Funds were provided for this work by equal contributions from the Power Sprayer Division of the Farm Equipment Institute, The National Sprayer and Duster Association, and by thirty members of the National Agricultural Chemicals Association. Through the cooperation of the United States Department of Agriculture, Research Service, the funds were used to establish the project at the Toledo, Ohio, laboratory. Mr. Frank Irons, in charge of the Toledo laboratory, has supervised the project since its beginning. An advisory group composed of representatives from industry has worked with Mr. Irons in this connection. Mr. Don Black, the project leader, is concerned with actual operation of the program, making contacts with industry and government sources, preparation of progress reports and implementing such cooperative investigations as are necessary.

Defining the Problem

THE first step taken by the industry-sponsored project was extensive interviewing of manufacturers of application equipment, users of application equipment and Federal and state research workers in agriculture to learn of the problems that actually existed equipment-wise in the application of agricultural chemicals.

Table I lists the sprayer and duster components affected by pesticides as determined in interviews by the project leader with nineteen different equipment manufacturers.

Sprayer Tank Corrosion

IN this study, sprayer tanks have been reported as the most common source of complaint according to the sprayer manufacturers. It should be mentioned, however, that although sprayer tanks are rated first as a source of trouble this does not by any means suggest loss of a tank in a spraying season. Most sprayer tanks in regular service stand up well for ten years or longer. What is meant can best be described by saying that the nuisance value of a sprayer tank is high. This is because of the gradual accumulation of scale in the tank, which sloughs off to plug nozzles and abrade pumps. Penetration of the tank wall does occur, but in most cases it is only after a long period of service. The predominance of sprayer tanks as a source of trouble can be attributed to no one cause but rather to a group of causes such as the following:

1. The material of construction, for reasons of economy and design, is steel. Steel is subject to rusting in the presence of moisture whether chemicals are present or not. A new steel sprayer tank can be ruined by failure of the operator to properly drain and house his equipment, due to the normal rusting that occurs from the presence of atmospheric moisture, rain, etc. Stainless steel tanks have been investigated but few growers are willing to stand the extra expense involved for such equipment and, of course, stainless steel itself is not resistant to *all* attack.
2. Failure of sprayer tanks can in many instances be traced to faulty operation. That is, the user himself is responsible because he has not used ordinary prudence

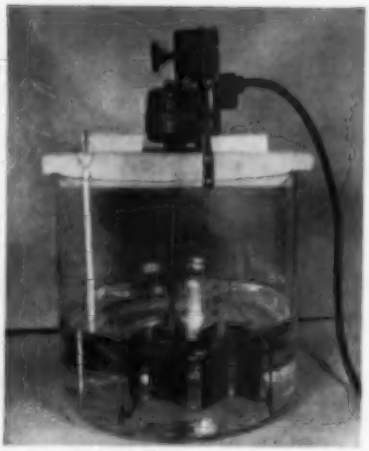


Figure 1
Typical laboratory corrosion test unit.

in the care of the equipment. Proper rinsing of the sprayer with clean water after each use will do much to prevent corrosion as will an oil coating on the inside of the sprayer tank during lay-up.

3. Another cause of sprayer tank failure is design. Some sprayer tanks are so designed that it is impossible to effectively clean the inside of the tank and in some cases drains are so located that complete drainage is very difficult. Much progress has been made by equipment manufacturers to improve the ease of maintenance.
4. The chemicals used in the tank may cause corrosion. This corrosion may be an immediate effect on the metal tank by highly corrosive substances such as acid sprays or the corrosive effect of the chemical may be a delayed action affair. For example, a typical chlorinated hydrocarbon insecticide, when used as directed in a sprayer, may cause no detectable corrosion when proper cleaning practices are used. However, if this same chemical is allowed to remain in the sprayer in contact with moisture for a period of time, the chlorinated hydrocarbon may hydrolyze to yield products of decomposition that are quite corrosive to steel and other metals. On the other hand, certain chlorinated hydrocarbons are more stable and do not easily decompose in the same situation. The safe procedure then is for the user to treat them all as being suspects and clean his equipment thoroughly after each use.

As a result of the findings in the survey of equipment, sprayer manufacturers have increasingly directed their attention to the use of protective coatings for the interior of the spray tank. New metal alloys are being tested as are fiberglass-plastic spray tanks. Other schemes, such as cathodic protection of the steel tank with magnesium are being investigated.

In addition, interest has been generated in other organizations able to contribute help to the problem. For example, at the 125th national meeting of the American Chemical Society in Kansas City this spring, a one day symposium was held on the "Mechanical and Engineering Aspects of Pesticide Application." Of the nine papers presented, three were concerned, in some measure, with the effect of pesticides on application equipment. Thus, a number of chemists engaged in agricultural research were briefed on the application performance of their products according to actual use experience. [2]

Corrosion Testing[3]

COINCIDENT with the development of new chemicals for agricultural use, testing programs are carried out by the chemical manufacturer to learn how a chemical affects equipment. If an adverse effect is noted, studies are undertaken to learn if other derivatives of the active chemical are less corrosive, if formulation changes can reduce corrosion, or if corrosion inhibitors can be found that may be included in the formulation.

In this work it is necessary to first decide how to test for corrosiveness so that when results are obtained they will bear some relationship to field use. On examining the available data on corrosion rates of various metals by agricultural chemical solutions, one finds that the exact method is sometimes not given, or that a variety of methods are used, or that an inappropriate method was used.

To be of most value, tests of this nature should provide for consideration of the following factors:

1. The test should be reproducible.
2. The time of exposure of test specimens to a given lot of solution should be comparable to field practice. Corrosion data is often reported that is obtained in static tests where a metal specimen was exposed to a given agricultural chemical solution for extended periods. Under such conditions, breakdown of the chemical with resultant formation of corrosive by-products may occur far beyond that experienced in normal use of the chemical.
3. Agitation should be provided. Statistic tests often fail to provide the conditions of aeration present in a spray tank, and thus do not expose the chemical to conditions as rigorous as in actual practice. Also, corrosion inhibitors on occasion may show good protection in a static test, but fail to give protection under conditions of sprayer tank agitation. Without agitation of the test solution, this fact may be overlooked.
4. The common metals of sprayer construction should be included in the test. This is desirable in order to observe any unusual effects from the presence of dissimilar metals in the actual sprayer.
5. The test method should be capable of evaluating the corrosiveness of the particular chemical of interest without regard to other chemicals that might be used with it in field use.

A simple corrosion test unit applicable to the agricultural chemical problem is shown in Figure 1.

This device embodies the factors previously discussed. A five gallon, round battery jar fitted with a center-located, three-bladed propellor type agitator is the heart of the unit. In practice, the agitator is driven at a constant speed in most tests. (The

speed may be varied if certain situations call for more vigorous agitation.) The unit is usually operated with two gallons of spray-strength solution. The specimen rack, made from stainless steel rod, is designed to hold four metal specimens 1" x 1½". These specimens may all be of the same metal or may be of dissimilar metals.

The temperature of the test may be controlled by addition of a thermostat (not shown).

The unit described is useful in laboratory evaluation of the corrosiveness of new agricultural chemicals as the test is rapid and only small amounts of materials are needed.

Tests were run using a commercial formulation of the alkanolamine salt of 2,4-D* at a spray concentration of one gallon to forty gallons of water. The exposure time was five hours at 75°F. The corrosion rate of cold-rolled steel in IPY (inches penetration per year) was found to be .0004. This is an extremely low rate. Field experience with the product bears this out, as we have experienced no corrosion troubles with it on steel equipment. Water itself is considerably more corrosive than this compound, an IPY of .0014 being reported for distilled water.[2]

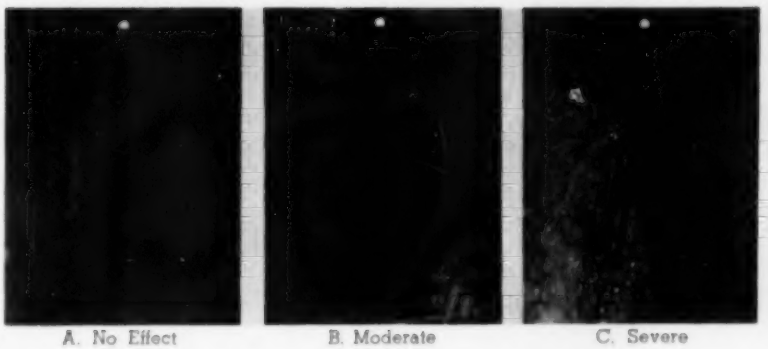
Much more than laboratory evaluation of the corrosiveness of a chemical is required in order to complete the picture. This is accomplished by close cooperation of laboratory personnel with the field experimenters and product development people. When a product is ready for the market, the "do's" as well as the "don'ts" have been thoroughly investigated, so that the user's equipment will not be harmed.

Rubber Hose and Gasket Deterioration

RUBBER hose and gasket deterioration became a serious problem at the time emulsifiable oil concentrates of DDT and 2,4-D esters came into general use. This was due to the necessity of incorporating highly aromatic solvents into the formulation to solubilize the toxicants. Aromatic solvents such as xylene are used for this purpose as well as other solvents of a highly aromatic character. These solvents are destructive to natural rubber and cause failure of components made from rubber. In addition, certain of the toxicants such as 2,4-D esters exert a deleterious effect on rubber. Equipment manufacturers have alleviated this problem through the use of the synthetic rubbers such as Buna-N or Thiokol for tube liners with Buna-N or Neoprene for a cover.[1] However, no rubber hose has been found completely suitable for handling soil fumigants or grain fumigants. Polyethylene tubing is useful in this service. Hoses utilizing a polyvinyl alcohol liner are satisfactory in this service only if water is excluded from the equipment, however, this is a difficult limitation to observe in actual practice.

Woven metal hose has been found to be quite satisfactory in fumigant service. Pump packings resistant to fumigant mixtures include leather, pre-formed leather packings, and metallic-type packings. Asbestos-type gaskets have been found satisfactory, as have polyethylene-type materials in this service.

*Dow Formula 40



A. No Effect B. Moderate C. Severe

Figure 2
Ratings of Typical Test Plates After Completion of Test

Abrasion[3]

ABRASION of pumps and other mechanical parts subject to spray solutions is a problem that is considered in every pesticide formulation. Such abrasion occurs with wettable powders, and in the case of organic toxicants such abrasion is generally due to the diluent used. Diluents are necessary in the formulation as they serve as grinding aids and adsorbents, permitting fast wetting, easily dispersed and finely ground forms of the toxicant to be prepared.

In order to compare the abrasion resulting from the use of certain commercially available diluents, the following test was devised. A John Bean power sprayer was obtained. Two spray nozzles were attached to the sprayer discharge line. In each nozzle a copper disc of known hardness was placed. The disc was perforated at the center with a 1/32 inch hole. The sprayer was loaded with one hundred twenty-five gallons of water and five pounds of the diluent in question. This mixture was sprayed out through the nozzles containing the copper discs. Before each run, the flow rate of water through the 1/32 inch hole in each disc was calibrated under standard conditions. After one hundred twenty-five gallons of diluent-water slurry had been pumped through the nozzles at one hundred ninety-five pounds per square inch, the copper discs were again calibrated to determine the increase in flow. Increase in flow rate was attributed to abrasion by the diluents. The values obtained for some common diluents are given.

Diluents	% Increase in Flow
Attapulgite-type diluent	4.8%
Floridin-type diluent	5.9%
Gypsum	9.6%
Diatomaceous earth	17.1%
Talc	6.5%
Diatomaceous earth	17.1%

Increase in flow was determined through a 1/32 inch copper orifice

(*Continued on Page 124*)

Caution Statements for Pesticide-Fertilizer

AS the use of pesticide fertilizer mixtures gains in popularity, and as the demand for this type product increases, manufacturers are confronted not only with the expected production problems, but must be prepared to consider what potential dangers may be associated with the handling and use of fertilizer-pesticide mixtures which may require or warrant the use of a warning or caution statement . . . and to what possible hazards the warning and caution statements should be directed.

It is generally recognized that if precaution is not exercised, there are a few types of injury which may arise from the use of some of the standard plant foods. If adequate precautions are not observed, the use of castor pomice may present a hazard to the applicator or a danger of toxicity to cattle grazing on treated land. The use of straight sulfuric acid as a soil amendment, or phosphoric acid as a plant food will present well-recognized potential problems of phytotoxicity and applicator hazards. And, of course, there is the ever-present problem of the unpredictable and insatiable bovine. In many ways, the bovine appetite is just as peculiar and unpredictable as is the appetite of an expectant mother. There is no accounting for taste. Old Bossy always has and, probably, always will be attracted by any salty tasting or nitrogenous fertilizer, such as sodium nitrate or urea.

These potential hazards are not new. They are well recognized. But as these problems are discussed with both industry representatives and control officials, it becomes apparent that the substantial potential hazards to the safe and effective use of fertilizers lie in the more recent and the anticipated future developments of the industry. Fertilizer-pesticide mixtures and liquid fertilizers may present potential problems of phytotoxicity and applicator hazard with which the average fertilizer manufacturer and user may not be familiar.

Some of the insecticides currently in use are relatively toxic. The use of these pesticides in combination with fertilizer may present potential problems arising from toxicity to the applicator or to persons or animals eating food or feed grown on land treated with the mixture. The use of some of the mixtures may present potential problems of phytotoxicity, if certain precautions are not exercised in their use.

If these fertilizers and fertilizer-pesticide mixtures are to be used effectively and safely, the applicator must be aware of these potential hazards. To what extent may this be accomplished through the use of warning and caution statements on the labeling? To what extent is it to be accomplished by education of the applicator through other media?

The control officials are the ones who must determine the extent to which precautionary labeling must be used in an effort to avoid these various types of possible injury. To what extent should the legal requirement for use of warning and caution statements be exercised?

For the answer to this question, we must look in two directions. First, what should be the function of a warning and caution statement? Second, to what extent are warning and caution statements now required by existing law?

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Combinations

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In considering the first question—the function of a warning and caution statement—we can all agree on a few fundamental principles, although we may differ on the applicability of these principles.

We will all agree that it should be the function of a warning or caution statement to advise the consumer, or the user, of any type of injury which the reasonably prudent man will foresee may arise from the use of that product. We enter the realm of controversy when we attempt to define the terms "reasonably prudent man" and "foreseeability." I think that no subsequent writer has more clearly defined the "reasonably prudent man" than did Lord Bramwell in an old English decision discussing the question of how high this "reasonably prudent man" should build his fence to contain his pigs. In his decision, Lord Bramwell made this scholarly observation:

> Nor do we lay down that there must be a fence so close and strong that no pig could push through it, or so high that no horse or bullock could leap it. One could scarcely tell the limits of such a requirement, for the strength of swine is such that they would break through almost any fence, if there were a sufficient inducement on the other side. But the company are bound to put up such a fence that a pig not of a peculiarly wandering disposition, nor under any excessive temptation, will not get through it.

Likewise we enter into the realm of controversy when we attempt to apply the term "foreseeability" to the hazards which may arise in the use of a product. How foreseeable should a potential hazard be before the requirement of a warning and caution statement is imposed? Clearly every type of injury which conceivably may arise in conjunction with the use of a product cannot be warned against. If this were required, the warning and caution statement would become so commonplace that it would lose its efficacy.

In applying these principles to determine whether a warning or caution statement will be required as a matter of law, or will be voluntarily used in individual cases, consideration will be given to these factors: (1) What is the nature of the potential hazard? Is it a hazard to human life or safety, or is it an economic hazard? (2) How serious may be the consequences of exposure to the potential hazard? (3) What are the probabilities of the potential hazard arising if it is not warned against? Is it one which may arise in the normal use of the product or is it likely to arise only if the product is misused, or used contrary to directions?

In evaluating these factors, more weight will be given to those hazards which present a threat to human life or safety than to those which present an economic hazard; to those which present a possibility of serious injury, as contrasted with those which present a possibility of a comparatively minor injury; and to those which are likely to occur in the normal use of the product, as contrasted to those which are improbable, or which may occur only if the product is misused or mishandled.

It is upon the basis of this appraisal that the decision will be made as to whether or not a warning or caution statement is required, and, if so, the nature of that statement. If it is determined that the potential injury is sufficiently probable and serious to warrant the use of a warning and caution statement, there are a few fundamental principles which should be followed in its formulation. These principles are concisely outlined in the LAPI Manual of the Manufacturing Chemists Association.

Of course, the name of the product and of its ingredients should be clearly stated and, in response to the requirements of existing law, will be. One of the signal words "danger," "warning," or "caution" should be used to denote the degree of severity of the potential hazard. This should be followed by a concise statement of the nature of the hazard. In most instances, this statement will be made much more effective if there is an explanation or warning of the type injury which may result if the precautions are not followed. The Supreme Court of California recently held a warning statement on a disinfectant to "keep away from direct sunlight" to be insufficient, because it did not advise the consumer that failure to keep away from direct sunlight might result in an explosion.

It is the fertilizer-pesticide mixtures which present the most immediate problems in the field of warning and caution statements. How are the enforcement officials of the fertilizer laws to cope with this problem?

The fertilizer laws of the majority of the states do not contain any provision relating to warning and caution statements. However, in my opinion, there is no problem arising from the lack of regulatory authority in most of the states. If there is a problem, it is in a plethora of such authority—or possibly in a lack of coordination in the exercise of such authority.

As most of you know, pesticides are rigidly regulated by a pattern of federal and numerous counterpart state laws. The Federal Insecticide, Fungicide and Rodenticide Act of

1947, and the Uniform State Act, form the backbone of this pattern. Twenty-five states have enacted legislation based upon the Federal and the Uniform Act. Sixteen other states, Hawaii, and Puerto Rico have enacted comprehensive pesticide laws, which vary in some detail from the federal and the uniform act.

The federal act, and most of the state laws, specify that a pesticide is misbranded if its label does not contain a warning or caution statement which may be necessary, and if complied with, adequate to prevent injury to living man and other vertebrate animals, vegetation and useful invertebrate animals. This statutory requirement has been supplemented by various formal interpretations, issued by the Department of Agriculture, setting forth what is considered to be adequate precautionary labeling. The primary interpretation is contained in Interpretation No. 18, dealing with warning and caution statements in general. There are other interpretations, which are specific to designated types of pesticides.

Because of the close cooperation between the officials charged with the responsibility for enforcing the federal and the respective state pesticide laws working through their Association of American Pesticide Control Officials, a pattern of warning and caution statement labeling has evolved in a form which is uniform in substantial detail.

Similarly, the labeling problems arising from the fertilizer-pesticide mixtures have been met in a number of states through the cooperation of the officials charged with the enforcement of the fertilizer and the pesticide laws. In the case of fertilizer-pesticide mixtures, it is, of course, immaterial whether the regulatory authority relating to warning and caution statements is contained in the fertilizer laws or in the pesticide laws, so long as such authority exists.

However, it is essential that, regardless of the statutory source of the regulatory authority, it be exercised in a moderate manner and with a degree of uniformity, which can be achieved only by close cooperation among fellow officials.

In the interest of such uniformity, the following principles are suggested for consideration:

First, be moderate in your regulatory requirements of warning and caution statements. Reserve the use of warning and caution statements for those hazards which present a real threat to the safe or effective use of the product. Do not dilute the efficacy of such statements by requiring their use to warn against hazards which are of minor consequence and are remote in probability.

This does not mean that such minor or remote hazards should be ignored. There are other ways in which they can be dealt with. Adequate directions for use may prevent potential injuries. There are a number of ways in which the state experiment stations can encourage safe and proper use of fertilizers, such as by printing general directions and precautions on the schedule of state recommendations and other literature published by the state.

Secondly, do not publish regulatory requirements which are more rigid than you believe to be necessary, with the intention to moderate those strict requirements by a soft enforcement policy. Bear in mind that regulations impose a legal obligation upon the fertilizer manufacturer of which the control official may not be the sole judge. The violation of this obligation may subject the manufacturer to heavy penalties in a product liability action. The jury in that product liability action, rather than the control office, will be the judge of whether the labeling meets the requirements of the regulations.

Third, make every reasonable effort to bring about uniformity through cooperation with officials of other states and of the federal government in the case of fertilizer-pesticide mixtures. It is only through such cooperation that effective precautionary labeling can be evolved and enforced.

A comparison of the regulations, pertaining to fertilizer-pesticide mixtures which have been published to date reveals a wide variation in requirements on minor details of precautionary labeling between some neighboring states, even though the policy on major points may be the same. This means that these requirements of precautionary labeling can be met only by the use of temporary tags.

It is true that the use of tags has developed as a custom in the fertilizer industry. Undoubtedly, the wide diversity in labeling requirements between the various states has been partly responsible for the development of this custom. Still, the use of tags which may easily be detached when the fertilizer bag is opened is not the safest medium for a warning and caution statement, nor is it the cheapest.

The development of a uniform labeling pattern between the various states would make it possible for the manufacturer to use bags with printed labels. Because the bags could be printed in volume, the cost would not exceed that of tags. It would simplify the warehousing and interstate distribution of fertilizers, and lessen the chance of inadvertent error arising from attaching the wrong tag for the wrong state. A few principles for consideration by fertilizer manufacturers follow:

First, comply fully with any regulatory requirement for precautionary labeling. Failure to do so may subject your company to civil liability as well as enforcement proceedings.

Secondly, use precautionary labeling to warn against any potential hazard, which is reasonably foreseeable, regardless of any regulatory requirement. Such voluntary compliance may make later regulatory action unnecessary. If the requirement for precautionary labeling is imposed by statute or regulation, the risk of noncompliance may carry a heavy civil liability. The same obligation voluntarily assumed carries no such risk of liability for noncompliance.

If such a policy of moderation, education and uniformity is followed by enforcement officials, and if such a policy of full and sometimes voluntary compliance is observed by fertilizer manufacturers, it is inevitable that such practice will assure the safe, effective and economical use of our products.★★



CALIFORNIA'S agricultural experiment station

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IT has been said, without too much exaggeration, that you can suffer sun stroke and frostbite without leaving the California Agricultural Experiment Station, which spreads over four campuses and eight field stations, and ranges from the Oregon to the Mexican border, a stretch of more than 700 miles; it also extends from experimental plots below sea level, in the desert area, to the High-Altitude Research Station in the Sierra Nevada, 12,500 feet above. This wide range matches the scope of agriculture with which the Experiment Station has to deal—in a state which grows 250 commercial crops on more than 1,200 types of soil, under a great variety of climatic conditions.

Under the direction of Dr. Paul F. Sharp, the Experiment Station is impressive by sheer size. In 34 departments, it carries out about 1,000 research projects annually, which are conducted by 600 staff members of professional rank, and a similar number of nonacademic personnel.

Campuses and major field stations of the California Experiment Station include: the Tulelake Field Station, Hopland Range Field Station, Grape Dry-Wine Field Station, Wolfskill Experimental Orchard, Davis Campus, Blodgett Experimental Forest, Berkeley Campus, San Jose Field Station, Antelope Valley Field Station, Los Angeles Campus, Riverside Campus and Citrus Experiment Station, and Imperial Valley Field Station.

The Experiment Station at Davis, under Assistant Director Dean Fred N. Briggs, looks back on almost 50 years of research. It is here that agronomists have used the backcross method of plant breeding to improve a great number of field crops over the past 30 years. They have developed wheat varieties safe from smut, rust, bunt, and Hessian fly, and alfalfa that is resistant to wilt, leaf spot, and downy mildew. The University-developed tomato variety, Pearson, is grown on 90 per cent of California's tomato acreage. Two yellow-resistant strawberry varieties, results of research at Berkeley and Davis, now represent 95 per cent of all strawberries grown commercially in California.

Pomologists and plant nutritionists at Davis, Berkeley, and Riverside determined that "little leaf" of deciduous fruit and "mottle leaf" of citrus were due to zinc deficiency. Through these experiments zinc was established as an essential element in plant nutrition. Among the many problems now studied in the Department of Pomology and at Riverside is the influence of plant growth regulators on fruit set, thinning, preharvest drop, fruit size and maturity.

Pomologists in Davis work closely with irrigation specialists. They have found that, contrary to popular belief, capillary action in the soil accounts for only little loss of moisture, and that most of the loss is due to transpiration from the foliage of plants. They also demonstrated that cultivation soon after soil has been wet is unnecessary and may actually increase moisture losses. The Department of Irrigation is well known for its work on the basic principles of plant-soil-water relations, and the establishment of such concepts as field capacity and permanent wilting percentage.

Often, two or more departments cooperate in research projects. One of the most successful of these cooperations involved the departments of Entomology, Plant Pathology, and Agricultural Engineering. They developed a method of seed treatments for many crops (including sugar beets, tomato, cotton, corn) which protects the crop from wireworm and maggot damage. The treatment, con-

sisting of a mixture of lindane and a fungicide, is used on 30 crops in California, and is being applied all over the country and abroad. Leo R. Gardner, manager of research at the California Spray Chemical Corporation at Richmond, California, has estimated the benefit to agriculture at "$100 million to a billion a year."

Also in Davis is the Department of Veterinary Science, under Dean D. E. Jasper, who is assistant director of the Experiment Station in charge of Veterinary Research.

Agricultural engineers have developed a vast variety of machinery. Four phases of sugar beet mechanization (seed processing, precision planting, mechanical thinning, and mechanical harvesting) have cut down labor requirements 65 man-hours per acre. They developed a smokeless orchard heater for frost protection in citrus groves. They now explore the use of electronics in agriculture. An apparatus has been developed that sorts fruits and vegetables for size and color, while another one detects and removes tramp iron from chopped hay to prevent cattle injury.

Entomologists at Berkeley developed the unsulfonated residue (UR) test (to measure harmful effects of oil sprays upon plants) which has been adopted all over the world. They found that the use of synergists will help overcome DDT resistance in houseflies. They constantly test new insecticides and recommend new uses: control of codling moth on fruits and walnuts, and practically all insect pests on tomatoes are samples of the results they achieved.

The Laboratory of Insect Pathology has diagnosed several hundred different insect diseases and is developing methods of killing off crop pests by causing epidemics among them. The most striking example is the control of the alfalfa caterpillar by a virus spread artificially in the field.

Plant pathologists at Berkeley have cooperated with those in Davis in many fields of basic and applied research. They have established a new species concept in fungi of the genus Fusarium; developed eradicant dormant sprays for brown-rot control of apricot; proved that Pierce's disease of grape and alfalfa dwarf are caused by the same virus; discovered that elgetol following scraping would inactivate old crown galls on fruit trees; and have established the sources of virus-free nursery stock for the control of stone-fruit viruses.

The Citrus Experiment Station at Riverside, under assistant director Alfred M. Boyce, is blessed with 350 days of sunshine a year. Here, staff members have compiled a long record of achievements, mostly for the benefit of the citrus industry. They have, for instance, found that a new rootstock, Troyer citrange, is resistant to gummosis and apparently also to quick decline. They developed the first control of red mites on citrus and walnuts by means of a synthetic organic acaricide (dinintro-o-cyclohexyl phenol). They proved Systox to be the first practical systemic insecticide for the same two crops. They originated the paint-brush method for corn ear worm control. They first used lindane, dieldrin, malathion, and chlorthion against resistant house flies. They developed a control program against citrus thrips with dieldrin. They first determined that smog was damaging to crops. And they checked sterilization methods by vapor-heat and chemicals to see how it affects California citrus fruit, in the event the Oriental fruit fly should invade the mainland from Hawaii.

Entomologists at Riverside have been concerned with the problems of insect resistance to insecticides since 1916 when they first demonstrated that the California red scale was resistant to hydrogen cyanide. They have taken the lead in the United States in studying mode of action and metabolism of systemic insecticides in plants and insects.

The subtropical climate of Riverside is favorable to studies of biological control. Parasite collectors are almost constantly abroad searching for natural enemies of crop pests. The cottony cushion scale and the citrophilus mealybug were completely controlled by imported parasites, which also have greatly reduced other pests, such as the citrus and long-tailed mealybugs, the citricola scale, black scale, yellow scale, and fig scale.

Studies concerning the problems of high desert agriculture are investigated at the Imperial Valley Station; while the problems of floriculture, subtropical and ornamental horticulture are reviewed at the station in Los Angeles, which is directed by R. W.

(*Continued on Page* 129)



Test application of a codling moth - aphid spray to walnuts, supervised by a Univ. Calif. entomologist. This 160-acre orchard is one of 8,000 plots owned by "cooperator" growers, who let the Experiment Station conduct field test.
Photo C. C. Anderson

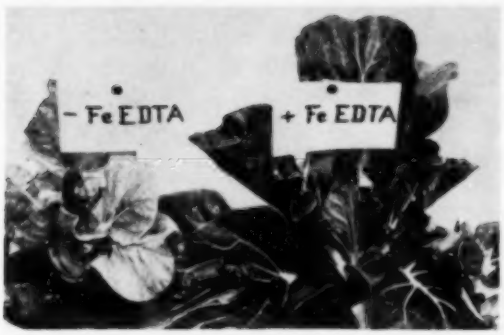


Photo P. J. Westgate, Central Florida Experiment Station.

Broadleaf Mustard: (left) plant taken from untreated portion of field; (right) plant from portion of field treated with 20 lbs. per acre of FeEDTA (12% Fe as metallic) applied as a broadcast application with fertilizer.

Iron chelates control Iron Chlorosis

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IRON deficiency or iron chlorosis as it is more commonly called has been, until recently, the most difficult minor element deficiency to correct. With the advent of Fe EDTA (an iron chelate) the deficiency is readily corrected under most conditions.

Iron chlorosis may be caused by one or a combination of the following:

1. Actual deficiency of iron in the soil.
2. Lack of available iron due to:
   a. High manganese content of the soil.
   b. High copper content of the soil.
   c. High pH (above approximately 7.0) of the soil.
   d. High lime ($CaCO_3$) content of the soil.

The condition of iron deficiency is readily diagnosed by visual examination of the leaves. In mild cases, the leaf veins are darker green than the areas between the veins, and as the deficiency increases, the areas between the veins become perceptibly yellow. In severe cases, the areas between the veins as well as the veins fade to an ivory color, and the plants become partially defoliated and die-back results. If the condition is not corrected the plant eventually dies.

Extent of Iron Deficiency:

IRON deficiency occurs on a wide number of plant species throughout the United States and the rest of the world. The list of plants affected includes various ornamentals, citrus, vegetable crops, deciduous fruits, grain sorghums, pineapples and bananas.

Recently, Kuykendall (1953) completed a survey of the Florida citrus in which he collected leaf samples from 123 groves in 21 counties, representing all the major citrus growing areas of the state. It was found that the mean leaf iron content for all varieties in all locations was 66.6 ppm and that in 41% of the groves the iron content was below 60 ppm. Results obtained by Stewart and Leonard (1953) have shown that the minimum iron content of the leaves should be 60 ppm, although chlorosis may not be evident.

Surveys similar to the above have not been conducted in other areas on other crops. It is shown, however, that iron chlorosis occurs quite generally on ornamentals throughout the United States, on citrus in the West and Southwest, on deciduous fruits in the West, on vegetables in Florida and on turf in many sections of the United States.

Iron Chelates—What Are They?

ORGANIC compounds which combine with metals to form a ring structure are called chelating agents (from the Greek word meaning claw). When a chelate, for example an iron chelate, is formed, the iron no longer possesses its characteristic iron properties. This means that the iron can no longer enter into chemical reactions to form such compounds as iron phosphates and iron hydroxides in which form the iron is unavailable to plants. Although the iron is rendered inactive chemically, it is readily available to plants when applied to the soil or the plant foliage. What this means is that most of the iron in the form of a chelate and only a small amount of the iron in an inorganic form such as ferrous sulphate is available to the plants. It should be pointed out that the term chelate and complex are commonly used interchangeably.

The iron chelate most widely used at the present time for the control of iron chlorosis is Fe EDTA. Chemically, the material is the iron salt of ethylenediamine tetraacetic acid.

Discovery of Fe EDTA For Use In Plant Nutrition:

THE pioneer work of Jacobson (1951) and Stewart and Leonard (1952) in the use of EDTA for solubilizing iron in the form of a

chelate or complex to render iron available to plants opened a new era in the field of minor element plant nutrition. In addition to the problem of iron chlorosis of plants growing in soil, iron chlorosis of plants growing in nutrient solutions also had long been a problem.

"Sequestrene®" is the brand name for chelating compounds produced by Alrose Chemical Co., Division of Geigy Chemical Corporation. Other products containing Fe EDTA include Versene[1], Nullapon[2], Tetrine[3] and Permakleer[4]. A great deal of research had been conducted with plants growing in nutrient solutions and in the field. The problem in nutrient solutions is that as the pH of the nutrient solution becomes more alkaline, which occurs as the plants grow, the iron is precipitated out as phosphates or hydroxides and repeated applications of iron are necessary. Compounds such as iron sulphate, iron citrate and iron tartrate were tested in nutrient solutions and all required repeat applications. In a study designed to find a more suitable iron compound, Jacobson found that the iron supply could be maintained in nutrient solutions by a single addition of ferric potassium ethylenediamine tetraacetate. He concluded that 5-10 ppm Fe as the EDTA complex was probably sufficient to provide iron to the plants. At present, due to the above discovery, Fe EDTA is being used throughout the world as a source of iron for plants growing in nutrient solution.

As a result of the above discovery, field research with FE EDTA was begun on citrus by Stewart and Leonard (1952) at the Lake Alfred Equipment Station in Florida. The problem of field control of iron chlorosis was that no compound had been found which could be applied economically. In addition to a number of compounds having been tested in the field, soil applications, foliage applications and tree trunk injection methods had been tested. Stewart and Leonard, working with sandy acid soils, found that the application of 20 grams of metallic chelated iron (1/3 lb. of Fe EDTA containing 12% Fe as metallic) per tree as a soil application, consistently resulted in good greening of trees which were severely iron chlorotic.

Commercial Use:

THE iron chelate of EDTA is being used commercially on a wide variety of plants and crops. It is being applied both as a foliage treatment and as a soil treatment, with the majority of it being applied by the latter method. For best results with soil applications, the material should be distributed uniformly over the soil surface beneath the plant and then thoroughly watered in to a depth of at least 6 inches. The material will remain effective if not watered in immediately, but complete greening will not occur until adequate moisture is applied artificially or by rainfall. Foliage applications should be applied as thorough cover sprays.

Citrus:

The above work has led to the commercial treatment of over 1 million iron chlorotic citrus trees with Fe EDTA in Florida. Application has been to the soil with the majority of the material being applied with one of the fertilizer applications. When not applied with fertilizer, Fe EDTA has been mixed with various inerts for ease of uniform application by hand.

Deciduous Fruits:

Scott (1953) found that Fe EDTA sprays were effective in correcting iron deficiency of pears in California when applied at a concentration of 0.02% Fe. As a result, some pear orchards have been treated commercially for 2 years with sprays of 1 pound of a Fe EDTA compound containing 12% Fe as metallic, per 100 gallons.

Vegetables:

Westgate (1952) working in Florida found that iron chlorosis of vegetables induced by higher copper content of the soil could be corrected by soil applications of Fe EDTA. With Fe EDTA treatment, crops such as Chinese cabbage and mustard greens could be produced on fields which previously resulted in crop failures. Application was at the rate of 20 pounds per acre of Fe EDTA (12% Fe as metallic) which was applied as a sidedressing with fertilizer. Other vegetables such as beans and cucumbers were greatly benefitted. Westgate and Wright (1954) have found that foliage sprays of Sequestrene NAFe applied at the rate of 1 pound per 50 gallons of water per acre are effective in correcting iron deficiency of vegetables induced by high copper. This work has led to a large percentage of the vegetable acreage in the Sanford area of Florida being treated with either soil or foliage applications of Fe EDTA.

Ornamentals (Including Shade Trees):

Wallace, et al (1953) in California found that lime induced iron chlorosis of a number of ornamentals including acacia, abelia, azalea, gardenia, liquidambar and magnolia as well as avocados and citrus could be controlled by soil applications of Fe EDTA.

Wright (1953a) treated chlorotic rose bushes growing on acid soil in Florida, and obtained complete greening with 12 pounds of Fe EDTA applied to the soil and with a foliage application of 2 pounds per 100 gallons of water.

Westgate (1952) applied Fe EDTA to gladioli and obtained very good response resulting in gladioli now being treated commercially with 20 pounds per acre of Fe EDTA (12% Fe).

A great deal more research than that discovered above has been done with Fe EDTA on ornamentals resulting in Fe EDTA being recommended and used commercially on a number of ornamentals including:

Azaleas	Liquidambar
Camellias	Magnolia
Cherry Laurel	Pin Oak
Carnations	Russian Olive
Gladioli	Spruce
Rhododendrons	Tree Box (American)
Roses	

1. Versene® — Product of Versenes Inc., Framingham, Massachusetts
2. Nullapon® — Product of Antara Chemicals, New York, New York
3. Tetrine® — Glyco Products Co., Inc., Brooklyn, New York
4. Permakleer® — Refinol Products, Lyndhurst, New Jersey

Turf:

Wright (1953b) and others have found that a wide variety of iron chlorotic turf grasses respond to applications of Fe EDTA applied in a dry form or as a spray, although some leaf tip burn has occurred in certain instances. Turf has been treated commercially at the recommended rate of ¾ pound Fe EDTA (12% Fe) per 100 square feet applied in the dry form, or 1 pound per 100 gallons as a spray.

Technical Aspects:

Use of Fe EDTA with Dolomite and Phosphates

WRIGHT (1953c) conducted an extensive study to determine the compatibility of the iron chelates with dolomitic and phosphatic fertilizers. The test was conducted on chlorotic orange trees in Florida growing on a sandy soil with pH of 6.5 to 6.7. Soil applications were made by hand of 2½ and 5 pounds each of dolomite, 20% superphosphate and triple superphosphate per tree. Each rate was applied with 1/3 pound of Fe EDTA, and sand was used as an inert where necessary, so that 5 pounds of material were distributed around each tree. Observations on degree of greening, rate of greening and residual effect showed that the effectiveness of the chelate was not reduced when applied with as much as 5 pounds per tree of dolomite, 20% superphosphate or triple superphosphate.

Residual Effect:

IN a test on chlorotic oranges in Florida growing on a sandy soil of pH 6.6 Wright (1954a) applied Fe EDTA (12% Fe) at rates of 1/3, 5/8, 2/9, 1/6, 1/9, and 1/18 pound per tree. Data obtained for a period of 13 months after treatment showed that the highest rate (1/3 lb.) resulted in faster greening than any of the lower rates. It was also found that regardless of rate of application or the degree of greening obtained, the flushes after approximately ten months showed visible symptoms of iron chlorosis, which remained after the flush growth hardened off.

Results on other plants have shown that the residual effect of a single application of Fe EDTA ranges from 2 to 12 months, the longer period of time being true for soil applications to relatively slow growing plants where the soil has a pH of approximately 5.5 and is low in lime content. Therefore, the criterion for retreatment is the appearance of iron chlorotic growth, and in general, retreatment rates should be ½ of the original rates.

Root Studies.

FORD (1953) worked with citrus on acid soils in Florida to determine the effect of soil applications of Fe EDTA on root distribution. He concluded that soil applications of Fe EDTA to iron deficient citrus trees resulted in a significant increase in feeder roots. Severely chlorotic Valencia orange trees had only 1 gram of feeder roots (expressed as the dry weight of feeder roots in a square foot column 5 feet deep) and trees treated with Fe EDTA had 8 grams. Treatment of moderately chlorotic trees increased the amount of feeder roots by 7 grams and the increase when mildly chlorotic trees were treated was 6 grams.

Citrus Fruit Quality and Size:

A STUDY was made by Sites et al (1953) of the quality of oranges growing on chlorotic trees and on nearby trees no longer chlorotic due to treatment with Fe EDTA. The juice from fruit from treated trees contained higher percentages of soluble solids and slightly lower citric acid with the increased soluble solids believed to be highly significant.

Wright (1954b) working with non-chlorotic Summerfield Navel and Parson Brown varieties of oranges found that the application of Sequestrene NAFe at the rate of 1/3 pound per tree increased the size of the fruit and significantly increased the % of soluble solids in the fruit. The increase in solids was such that the treated blocks in the test were harvested approximately 2 weeks earlier than the untreated blocks, as a result of the required solids/acid ratio being reached earlier.

Absorption:

At present, it is not definitely known whether the Fe EDTA is taken up by plant roots as a molecule or if only the Fe is absorbed and translocated. Data from C^{14} labelled Fe EDTA (Leonard & Stewart, 1953), N^{15} labelled Fe EDTA (Wallace & North, 1953) and split root translocation studies (Weinstein, et al 1954) indicate that the EDTA molecule enters the plants.

New Fe Chelates:

AT the present time, a number of of new iron chelates are being tested and developed. This testing is aimed at the development of chelates which will be more effective on alkaline and calcareous soils than Fe EDTA.

Chel* 330 Fe (the iron chelate of diethylenetriamine pentaacetic acid) is being extensively field tested at the present time and will be available commercially in the near future. Versen—OL®** (the iron chelate of N-hydroxyethylethylene diamine triacetic acid) is being marketed at the present time.

Future of Chelated Iron:

The future of iron chelates in the field of plant nutrition is unlimited due to the development of new chelates plus the fact that as research progresses, effects other than the remedy of iron chlorosis, such as increased fruit quality, are obtained. It should be emphasized, however, that iron chelates are not a cure for all types of chlorosis. That is, they will cure chlorosis due to iron deficiency and not chlorosis which is due to excessive moisture, nitrogen deficiency, manganese deficiency and other causes.

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(*Continued on Page 131*)

*Chel is the registered trade name for cation exchange materials and water solutions of alkalies sold by Geigy Chemical Corporation, 89 Barclay Street, New York, New York.

**Product of Versenes Incorporated, Framingham, Massachusetts.

RYANIA . . . as a housefly

SOME of the most important uses of ryania as an insecticide are against the larval forms of various species. Some outstanding examples are, European cornborer (1), sugarcane borer (2), and cranberry fruitworm (3,4). Therefore, it seemed that ryania might give a good kill of housefly larvae. Products prepared from *Ryania speciosa*, Vahl. roots have been reported in a general way as being effective against the housefly (5). Some work has already been done by the late Dr. Barber and Drs. Eleanor and Ordway Starnes on housefly larvae(6). They mixed ryania into the diet of guinea pigs and found that the fecal material was toxic to larvae, but the details of their experiments have not been reported.

Experiments reported here were run using various forms of the housefly reared as directed in the Peet-Grady Method (7).

Lack of Ovicidal Activity

RYANIA was tested for ovicidal effects and the results were negative. Aqueous suspensions of ryania up to a concentration of 10% were applied to filter paper in petri-dishes and the housefly eggs were placed on the wet filter paper. The number of hatched eggs was observed 15 to 20 hours later. In untreated dishes the normal mortality of eggs or failure to hatch was found to be between 6 and 7%. The mortality of eggs in contact with 10% suspension of ryania was not significantly greater than the controls, but the larvae were dead or moribund. Many of the newly hatched larvae in contact with only 0.1% suspension of ryania were moribund. Ryania affects the larvae rather than the eggs.

Larvicidal Activity

FURTHER observations on the toxicity of ryania to housefly larvae were made by adding various amounts of ryania to the CSMA standard fly larval medium. In the normal process of rearing houseflies, the following amounts were calculated for each jar:—340 g of standard fly larval medium, moistened and mixed with 750 ml. of an aqueous suspension containing 5.0 g. of activated dry yeast and 10 ml of diamalt. The total weight of moist medium per jar was about 1090 g. and the dosages reported were calculated on that basis. The prepared medium was placed in battery jars at 80°F, allowed to ferment for one day and then seeded with eggs to produce 1500 to 2000 pupae. About 90% of the eggs sown produced pupae.

The results in Table I show that a 99.9% mortality of larvae was obtained when 0.5% of ryania was mixed into the moist medium just before the eggs were sown. Ryania is apparently much more toxic to the freshly hatched first instar larvae than to larvae which are one or two days old, because 0.5% ryania mixed into the medium 2 days after the eggs were sown gave only 48% mortality in comparison with 99.9% mentioned above. The effects of various concentrations and conditions are shown in Table I. As little as 0.1% ryania gave a good reduction in the number of pupae surviving, or 86% kill.

The development of the surviving larvae in contact with ryania in the fly larval medium was not normal even when the concentration of ryania was as low as 0.1%. The larvae remained small. They were delayed in pupating and the pupae were one-third to one-half the size of the normal housefly larvae.

Furthermore, the adults that emerged from these pupae were only one-third to one-half the size of the normal houseflies. Even so, viable eggs were obtained from the small flies.

Observations on the emergence of adult flies from the small pupae showed that many of the larvae had ingested a lethal dose of ryania, but were not killed until they reached the pupal stage. Normal mortality of pupae ranges between 5 and 10 percent, but the mortality of pupae from larvae which were fed on media containing ryania, increased as the concentration of ryania increased.

The results in Table I also show the effect of applying ryania to the surface of the jars. In one series, the ryania was applied and then wet down with water to carry the toxic material into the larval medium. In this case, the mortality was higher at the high applications of ryania, but it was necessary to work the ryania into the larval medium to obtain a high kill at 0.5% of ryania.

Table I shows that small amounts of ryania (0.1%) as a layer on top of the medium gave an 85% kill. The effective concentration was greater than 0.1% since larvae which are ready to pupate crawl close to the surface and then come in contact with a higher concentration of ryania.

Ryanexcel (R) 96-3, which is a combination of 95.8% ryania, 3.2% n-propyl isome and 1.0% wetting agent, was also tested as a larvicide.

larvacide

By Donald F. Starr and Douglas R. Calsetta
S. B. Penick & Co.
New York, N. Y.

In six comparisons, Ryanexcel was 1.5 times as effective as ryania in producing a mortality of 90%. A summary of the results is shown in Table II.

Since it has been found that the newly hatched larvae are more susceptible to ryania than the more mature forms, it would be important to have ryania present in the manure or fly breeding material before or soon after the eggs were laid, if ryania or Ryanexcel 96-3 were to be of practical value in fly control.

Residual Larvicidal Activity

A SECOND question of importance if ryania is to have any practical value as a housefly larvicide, concerns the length of time ryania or Ryanexcel remains toxic in the larval medium. The standard larval medium, after having been used for rearing housefly pupae and observing the toxicity of 0.2% and 0.4% of Ryanexcel 96-3, was moistened and seeded a second, third and fourth time with eggs. The experiments show that fly larval medium containing toxic amounts of Ryanexcel 96-3 remains toxic for at least three weeks. There was an apparent increase in toxicity in the older medium, but there was also a loss in nutritive value as indicated by a lower yield of pupae from the untreated control jars. It is probable that the toxic effects are more pronounced with poorer developmental conditions for the larvae. The results are summarized in Table III.

Except for the special tests on the persistence of the toxic effects of Ryanexcel 96-3 in the fly larval medium, all the observations on the toxic effects of ryania insecticides were made in freshly prepared medium.

Development of Resistance to Ryanexcel

STRAINS of houseflies resistant to most of the chlorinated insecticides have been reported and treatment of the larval medium or treatment of both larvae and adults has been an effective procedure for producing resistant strains in the laboratory (8). Therefore, experiments were started to determine how many generations would be required to select a strain resistant to Ryanexcel 96-3.

The CSMA 1951 strain of houseflies was reared through 20 filial generations in the larval medium treated in each case with 0.1% Ryanexcel 96-3. After 20 generations, the Ryanexcel was increased to 0.2%. A total of 50 generations have been reared. A summary is shown in Table IV which indicates that a little resistance had developed as early as the third generation. The resistance was indicated by a drop in mortality from 91% to 53%. From this difference and the concentrations required to kill 90%, the resistant strain is estimated to be three or four times as resistant as the original strain. This is a very low order of resistance. Of primary importance is the fact that no significant difference in resistance was observed between the 6th generation and the 50th.

Resistance to DDT may run 230 to 300 times normal in the field (8,9) and 580 to 780 times normal in the laboratory (8).

During the attempt to develop a strain of houseflies resistant to Ryanexcel, it was observed that the adults from surviving pupae did not lay as many eggs as the normal laboratory flies. The eggs were less viable since only about a third as many were recovered from untreated jars of the fly larval medium as expected on the basis of normal rearing of the laboratory strain.

In the laboratory of Bruce and Decker (8), resistance to six different chlorinated hydrocarbon insecticides was developed in the NAIDM strain of houseflies which was very similar to the CSMA 1951 strain which was used in these experiments. Resistance of 585 times the original was developed by exposure of 9 generations of both larvae and adults to DDT. With methoxychlor, a resistance of 185 times was observed

in 12 generations. Development of resistance was not confined to the chlorinated hydrocarbon insecticides since a 20 fold resistance to a mixture of piperonyl butoxide and pyrethrins was observed in a laboratory strain of flies after 30 generations were exposed to that mixture.

On the basis of these results, it seems to be more difficult to develop resistance to Ryanexcel than to DDT or methoxychlor.

Residual Effect of Ryanexcel

IN considering ryania as a possible tool in practical fly control, it was found that Ryanexcel 96-3 was only weakly effective as a residual insecticide. Residues of 200 to 400 mg. per sq. ft. seemed more effective on glass than on kraft paper. Actually, the residues did not adhere well on glass and the test flies were effectively dusted with ryania. The results on kraft paper probably indicate the residual insecticide activity of Ryanexcel. A long exposure of 24 hours to a residue as high as 400 mg. per sq. ft. failed to give significant kill on the paper.

Ryania Baits

RYANIA and Ryanexcel 96-3 were toxic to adult houseflies as stomach poisons in 24 to 48 hours when added to their standard milk diet at 0.1 or 0.2 percent. Fresh milk preparations were supplied the second day. The results at concentrations from 0.1 to 0.5 percent are recorded in Table V.

The high kills observed in 48 hours raised the question as to whether a toxic dose might have been taken during the first few hours of feeding, and the remainder of the 48 hours could have been required to produce death. Hungry flies were offered milk containing 0.5% ryania or Ryanexcel 96-3 for two hours and then fed a normal milk diet for 48 hours. The mortality values were only 10 to 20 percentage points higher than the untreated controls. More than two hours feeding are required to obtain a good kill of adult flies.

Flies were given a free choice between milk and food baits containing 0.5% ryania or Ryanexcel. The mortality observed in 48 hours was 60 to 70%. Both milk and 10% sugar solution were tried as bait materials.

Comparison of Larvicides

DURING the consideration of ryania and Ryanexcel as housefly larvicides, it was important to know how these materials compared with other insecticides and other materials that have been recommended as housefly larvicides. Some preliminary tests are shown in Table VI.

These results indicate that both lindane and malathion are more toxic as larvicides than ryania against the CSMA 1951 strain of houseflies. It is already known that housefly strains in nature are much more resistant to lindane than our laboratory strain, so that these results probably don't indicate much toward practical control. Malathion appears to be an excellent larvicide, but it is also a very effective residual insecticide and if used as both, a larvicide and a residual insecticide, there may be a great

Table I

Percent Mortality of Housefly Larvae With Various Treatments of Ryania

Concentrations of Ryania	Method of Applying Ryania		Layer Applied On Top	
In The Fly Larval Medium	Mixed Before Eggs Were Sown	Mixed 2 Days After Eggs Were Sown		Wet Down With Water
10%	100	—	91	100
5%	100	—	97	100
1%	99.97	—	88	75
0.5%	99.9	48	78	70
0.1%	86	56	85	22
Control*	11,200	4,000	5100	1200

*These are the estimated numbers of larvae exposed to the various ryania treatments.

Table II

Comparison of the Housefly Larvicidal Effect of Ryania and Ryanexcel 96-3

(Average of six tests—June and September)

	Percent Kill At Two Concentrations		
	Controls*	0.1%	0.3%
Ryania	12,250	78.9	98.0
Ryanexcel	11,730	90.3	99.6

*Estimated number of larvae treated by each insecticide at each concentration.

Table III

Persistence of the Toxic Effects of Ryanexcel 96-3 in Housefly Larval Medium

	Controls		Ryanexcel 96-3 Content	
Age Of Media	Survivors.	Avg. wt. of Pupae mg.	0.2% Survivors.	0.4% Survivors.
Freshly prepared*	1800	21	29	3
One week	800	20	3	0
Two weeks	740	7	0	0
Three weeks	189	7	0	0

*Average of 8 tests.

Table IV

Attempts to Develop Resistance to Ryanexcel 96-3 in the CSMA 1951 Strain of Houseflies

Filial Generation	Percent Mortality Ryanexcel 96-3 Concentration				Concentration Required to kill 90%
	0.1	0.2	0.3	0.4	
0 (a)	91	99	99.7	99.9	0.094
3	53	—	—	—	—
6	35	38	—	96.5	0.30
11	62	—	98	—	0.18
15	57	—	95	—	0.22
21 (b)	46	84	99.6	—	0.20
31	—	74	—	99.3	0.26
50	—	46	—	98	0.36

(a) The parental generation. The results recorded are the averages of several experiments.

(b) The 21st filial generation and all subsequent generations were exposed to 0.2% Ryanexcel 96-3 in the larval medium.

Table V

Ryania Insecticides as Stomach Poisons for Adult Houseflies

Fed in milk—no other food available

Insecticide	Concentration Percent	Percent Mortality 24 Hrs.	48 Hrs.
Untreated	—	3	5
Ryania	0.1	16	38
Ryanexcel 96-3	0.1	38	91
Ryania	0.2	36	82
Ryanexcel 96-3	0.2	61	100
Ryania	0.5	72	94
Ryanexcel 96-3	0.5	80	100

Table VI

Comparison of Various Insecticides as Housefly Larvicides

Insecticide	Concentration Percent	Larval Mortality Percent
Malathion	0.001	100
Malathion	0.002	100
Lindane	0.001	76
Lindane	0.002	92
Ryanexcel 96-3	0.1	86
Ryanexcel 96-3	0.2	99.7
Ryania	0.1	77
Ryania	0.2	95
Borax	0.1	38
Borax	0.2	93

er hazard of developing resistant strains than if one insecticide were used for its residual effect and an entirely different one as a larvicide.

One of the recommendations (10) by Bishopp, Assistant Chief of the Bureau of Entomology and Plant Quarantine, specifically stated, "Do not use the same material as a larvicide as is used as a residual spray."

The most commonly recommended chemical for the control of fly larvae is borax. Ryania equals the larvicidal effect of borax without the hazard of introducing phytotoxic quantities of borax into the soil. As little as 100 parts per million of borax reduces the yield of crops in some soils (11). Traces of boron in soils are beneficial, but residues of more than 50 parts per million of borax should be avoided.

Discussion of Results

WHETHER larvicides such as ryania and Ryanexcel will have a practical place in fly control is a problem which will require carefully selected, extensive field tests. Very little could be accomplished if one owner carefully treated the outdoor toilet, fresh manure, and waste food materials with a larvicide while his neighbor permitted attractive breeding areas to supply flies for both premises.

In conducting such tests, ryania should be applied to fresh manure so that it will come in contact with the first instar larvae. Ryania is much more toxic to newly hatched larvae than to the older ones. Sprinkling the barn floor with a 5% suspension of ryania each day before the barn is cleaned, should provide protection for the manure pile and also spots in the barn that are not thoroughly cleaned.

Ryania is one of the insecticides having a low order of toxicity to warm-blooded animals and therefore, there should be no hazard in the use of aqueous suspensions in barns. Application of ryania as a dust would probably contaminate mangers and feed boxes and although such contamination should not be injurious to livestock, it should be avoided if possible.

Early in the season, the barnyard could be treated with either ryania powder or suspension about every two weeks. In breeding areas with a minimum of nutrients, less ryania is required.

Since ryania is not as toxic to adult houseflies as to the larvae, significant reduction in fly populations due to the larvicide would require about two weeks.

If ryania finds a useful place as part of a housefly control program, such usefulness should continue for several years before resistant strains develop to the point that is now observed for chlorinated hydrocarbon insecticides.

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Fertilizer Calculations Series

A series of booklets by James E. Garton on fertilizer calculations has been issued recently by the Agricultural Experiment Station, Oklahoma A & M College, Stillwater, Okla. The booklets contain a series of nomographs which allow for rapid calculation, by simple linear application. The following booklets are contained in the series:

MP-35 Calculation of Pounds of Fertilizer Per Acre for Different Concentrations

MP-36 Calculation of Comparative Cost per Unit of Nutrient Element from Different Fertilizers

MP-37 Calculation of Amount of Fertilizer per Row, for Gardens

MP-38 Calculation of Amount of Fertilizer for Lawns

MP-39 Calculation of Amount of Nitrogen Fertilizers for Trees

MP-40 Calculation Chart for 10-foot Fertilizer Spreader

MP-41 Calculation of Fertilizer Applications by Sprinkler Irrigation



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F.O.A. Technical Program

Univ. of Calfiornia and Texas A.&M. College Contracts Underway

IN the United States 100 million dollar program* of technical cooperation with foreign countries, some 30 U. S. land grant colleges and experiment stations have contracted to participate in executing various phases of the plan. General fields of activity cover agriculture, home economics, health, industrial development, teaching, training, etc.

One of the most recent of the FOA (Foreign Operations, Administration) contracts, which was still in the process of being approved at the time this article was prepared, is the proposed arrangement between the College of Agriculture of the University of California and the National Taiwan University. This contract provides for sending five specialists to advise the National Taiwan University in regard to its college of agriculture, and to assist in its development. Taiwan has requested assistance in the fields of general administration, horticulture, agronomy, veterinary science, animal husbandry, and extension. As the California representatives determine what the particular problems of Taiwan agriculture are, and what practice and control measures are most suitable, we hope to have an up-to-date report in *Agricultural Chemicals*.

The FOA sponsored contract between Texas A.&M., College Station, Texas and the University of Dacca, Pakistan, is another program which has gone into effect only recently. About seven representatives of the Texas college were scheduled to set up operations in Pakistan the first week in October. Dr. H. E. Hampton of Texas A & M's department of agronomy is serving as chief advisor to the group and heads the staff working with the East Bengal Institute of Agriculture at Dacca.

Since Dr. Hampton had not previously been in Pakistan, and had no first-hand knowledge of conditions there, his preliminary planning was limited. Among his first activities will be as thorough a study as possible of local conditions and immediate consideration of critical problems.

"A completely different type of agriculture is only one of the things to be taken into account," he said before leaving. Land in Pakistan is farmed much more intensively than in the United States, he pointed out, so problems dealing with soil conditioning, fertilizers and land usage will be unlike anything we have here.

Other members of the group who will be located at Dacca include E. H. Andrew of the electrical engineering department, and J. H. Caddess of the mechanical engineering department who will work with the Ansanullah Engineering College; and W. E. Shelton, an A. and M. graduate who is serving as assistant professor of education at the Illinois Southern University until time for him to join the Teachers Training College at Dacca.

George P. Blevins, an accountant in the A. and M. comptroller's office will be stationed at Chittagong and will work with the Government College of Commerce. N. A. McNeil, who was working on a post-graduate degree while teaching genetics at A. and M. will work with the Primary Teachers Training College at Mymensingh.

Dr. H. L. Foust, retired head of the veterinary anatomy department at Iowa State College joined the group of Texans to work with the East Bengal Veterinary College. This veterinary college includes instruction which would be offered by the veterinary school and the animal husbandry department of an American school.

D. W. Williams, vice-chancellor for agriculture in the Texas A. and M. College System, and Dr. F. C. Bolton, president emeritus of the college, recently completed a trip to Pakistan to study conditions and explore the possibilities of the cooperative program, which grew from their report. According to Mr. Williams, other short-term specialists may be sent to Pakistan in the future to contribute to the FOA plan if such action seems justified. While there, the American specialists also will assist

(Continued on Page 135)



Fazl Hosain, left, who studied at Texas A. and M. College as a Point 4 trainee, shows Red Sindhi cattle to D. W. Williams, vice-chancellor for agriculture of the Texas A. and M. College System, and Dr. F. C. Bolton, president emeritus of the college during their trip to Pakistan. Hosain raises the milk-type cattle on the Pakistan government's Red Sindhi Farm near Karachi, capital of the country.

*"Foreign Operations Administration Technical Program," pp. 40-41, September, 1954, AGRICULTURAL CHEMICALS.



New fertilizer control officers, (l.-r.) M. P. Etheredge, Miss., vice president; Bruce D. Cloaninger, S. C., secretary-treasurer and R. W. Ludwick, N. M., president.



Industry representatives talk things over. From left, Arthur Smith and D. R. Stoneleigh, Mathieson Chemical Corp.; Philip MacG. Shuey, Shuey & Co.; and Truett Cook, Mathieson.

Liquid Fertilizer, Herbicides,

Highly Toxic Pesticides Aired as

Control Officials Meet

FERTILIZER and pesticide control officials dealt with their usual share of problems last month in Washington as they gathered at the Shoreham Hotel for their annual association meetings.

They met Oct. 15 and 16, respectively, for their eighth annual conventions. The pesticide meeting concluded a week of control meetings which started Oct. 11-13 with the Association of Official Agricultural Chemists, and continued with the Association of American Feed Control Officials Oct. 13-14.

Among the many knotty problems dealt with by the Association of American Fertilizer Control Officials at their meeting were these:

1. What controls should be placed on oil companies getting into the agricultural business by supplying liquid fertilizer for lawns?

2. Should any fourth mineral be permitted to appear as part of the brand name or grade on a fertilizer package?

3. What should be done in the way of controlling sale of fertilizer pesticide mixtures?

Confronting the pesticide group, which officially changed its name from the Association of Economic Poisons Control Officials, Inc., to the Association of American Pesticide Control Officials, were these questions:

1. Is herbicide control legislation properly a part of the pesticide control official's functions?

2. What is the most acceptable definition of the word "concentrate?"

3. What is the best way to handle pesticides that appear too toxic for general sale no matter what precautionary labeling is used?

In addition to dealing with the problems that came up during the course of the year in the complex job of controlling the sale of agricultural chemicals, the groups also heard guest speakers and elected officers for the coming year.

A.O.A.C., the parent group, elected William F. Reindollar, of Maryland, president, K. D. Jacob, USDA, vice president, and reelected William Horwitz of the Food and Drug Administration as secretary-treasurer. John B. Smith, of Rhode Island, was named to the executive committee.

The fertilizer officials moved R. W. Ludwick, of New Mexico, up to president and chose M. P. Etheredge, of Mississippi, to succeed him as vice president. Bruce D. Cloaninger, of South Carolina, was returned as secretary-treasurer.

Completing the roster of new officers, the pesticide officials chose



New pesticide control officials meet with W. G. Reed, USDA, left. They are Clyde A. Bower, Okla. vice president; E. A. Epps, La., president and A. B. Heagy, Md., secretary-treasurer.



Past presidents of pesticide group are honored with plaques. From left, Floyd Roberts, N. D.; J. F. Fudge, Tex.; R. C. Berry, Va.; H. J. Hoffman, Minn.; A. B. Lemmon, Cal.; J. L. St. John, Wash. and E. W. Constable, N. C.

E. A. Epps, of Louisiana, as president and C. A. Bower, of Oklahoma, as vice president. A. B. Heagy, of Maryland, was renamed secretary-treasurer.

The fertilizer and pesticide industries were well represented at the meetings. Sixty-two persons from the fertilizer industry attended the fertilizer meeting and 14 sat in on the pesticide talks.

In addition, Dr. Russell Coleman, president of the National Fertilizer Association, and Paul T. Truitt, president of the American Plant Food Council, addressed the A.A.F.C.O. Both associations acted as hosts for banquets Thursday and Friday evenings honoring the fertilizer group.

Getting back to the problems facing the officials, here's what the fertilizer control group had to say about the big ones facing it:

1. Oil companies selling fertilizers to level out their business, should be under control, the same as any other fertilizer manufacturer. The problem is virtually the same as that with liquid fertilizers, the association agreed. A meter to be placed at the end of the spray line is being developed, which will make possible checking the quantity delivered. The concentrate used to make the fertilizer can be analyzed in the conventional way.

2. Once again the fertilizer control men decided that only confusion would result from placing a fourth numeral on fertilizer bags. The manufacturer doesn't always have the same material in mind when he uses a fourth number, and the addition of one more numeral could lead to a long line of others being added. The recommendation is that no more than

Fertilizer officials meet after NFA banquet. From left, Willis Rickerson, Okla.; W. L. Hunter, Cal.; Parke Yeats, Okla.; Earl Straub, Mo. and Crawford Winston, Okla.

Rodney C. Berry, Va., left, talks with J. D. Patterson, Ore., and E. W. Constable, N. C. at the convention meeting room in the Shoreham.







Upper left: W. G. Reed, USDA, left, Stacy B. Randle, N. J. and M. R. Clarkson, Agricultural Research Service, USDA, a speaker at the convention.

Upper right: Floyd Roberts, N. D., left, and A. B. Heagy, Md., right, talk with Dr. Philip J. Spear, National Pest Control Assoc., another speaker at the convention.

Lower left: Edwin C. Kapusta and Malcolm H. MacVicker, NFA, talk with P. W. Gull, Spencer Chemical Co., William Heard, John Deere & Co., and W. L. Nelson, American Potash Institute.

Lower right: W. A. Minor, USDA, left, chats with Bruce D. Cloaninger, S. C., after banquet which was well attended by industry representatives.

three numerals be permitted.

3. On the sale of fertilizer-pesticide mixtures, the A.A.F.C.O. heard this report from A. B. Lemmon, of California:

"It is recommended that all states follow uniform practice of requiring fertilizer-pesticide mixtures to be labeled fully in accordance with the requirements of both the fertilizer laws and the pesticide law. It is recommended that 'custom mixtures' or 'farmers mixtures' of fertilizers and pesticides be required to be registered, and if the state law does not now require such registration of custom mixtures, study should be given to the possibility of amending the law. . . . It is recommended that all regulatory officials carry on an aggressive cooperative program with members of the state experiment stations and the industry to develop data which will serve as an adequate basis for sale, use and regulation of . . . mixtures."

On other questions, the group expressed interest in having guarantees for phosphorus and potassium changed from an oxide to an elemental basis, and heard a report from research workers on the outlook for urea-formaldehyde polymers in mixed fertilizers. A definition of urea-formaldehyde fertilizer materials, submitted by M. P. Etheredge, of Mississippi, stated that the materials "are reaction products of urea and formaldehyde containing at least 35 per cent nitrogen largely in insoluble but slowly available form . . . "

Henry A. Davis, of New Hampshire, in his presidential address, summarized the year's activities and called for continued efforts by the group to change the phosphorus and potassium guarantees to P and K instead of the oxides. He urged wider distribution of the official report of the association to industry members.

Both Dr. Coleman and Mr. Truitt praised the work of the control officials in their addresses. Dr. Coleman used slides to illustrate a talk on fertilizer trends, which showed, among other things, that through the past 20 years, mixed fertilizers have represented approximately 70 per cent of all plant foods consumed. He cited other figures to show that the percentage of total phosphate and potash going into these mixtures has risen in that period while the percentage for nitrogen is down. He emphasized the fact that this refers not to quantity of material used but to percentage of each of the materials going into mixes. He said the increasing use of anhydrous ammonia had caused the percentage drop for nitrogen in mixed goods. He said use of triple superphosphate and muriate of potash also had increased steadily since 1930.

Mr. Truitt listed two "things to watch in 1955" which he said would affect agriculture: population increases and bigger demands for food; and labor income equal to the record high, with farm income down slightly from this year.

(*Continued on Page* 119)

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Tolerances established under Sec. 406

Pesticide	Tolerance in p.p.m.	Fruits and vegetables to which tolerance applies
Aldrin	0.1	Potatoes, sweet potatoes
Benzene hexachloride	5	Apples, pears, quinces, apricots, avocados, cherries, citrus fruits, grapes, guavas, mangoes, peaches, nectarines, pineapples, plums, strawberries, asparagus, beans, black-eyed peas, broccoli, cabbage, brussels sprouts, kohlrabi, cauliflower, corn, eggplants, kale, collards, lettuce, mustard greens, okra, onions, peas, peppers, spinach, Swiss chard, tomatoes
Calcium arsenate	3.5 of combined As_2O_5	Blueberries (huckleberries), raspberries, blackberries, loganberries, strawberries asparagus, beans, black-eyed peas, broccoli, cabbage, brussels sprouts, kohlrabi, cauliflower, carrots, celery, corn, cucumbers, eggplants, kale, collards, melons, peppers, pumpkins, spinach, squash, tomatoes, turnips
Copper arsenate	3.5 of combined As_2O_5	Cabbage, brussels sprouts, kohlrabi, cauliflower, carrots, tomatoes
DDT	7	Apples, pears, quinces, apricots, avocados, blueberries, (huckleberries), cherries, citrus fruits, cranberries, currants, gooseberries, grapes, guavas, mangoes, papayas, peaches, nectarines, pineapples, plums, raspberries, blackberries, loganberries, rhubarb, strawberries, artichokes, asparagus, beans, black-eyed peas, beets, broccoli, cabbage, brussels sprouts, kohlrabi, cauliflower, carrots, celery, corn, cucumbers, eggplants, endive, kale, collards, lettuce, melons, mushrooms, mustard greens, pumpkins, radishes, rutabagas, spinach, squash, tomatoes, turnips
Chlordane or heptachlor	0.1	Potatoes
2,4-Dichlorophenoxy acetic acid	5	Apples, pears, quinces, citrus fruits.
Dicyclohexylamine salt of dinitro-O-hexylphenol	1	Apples, pears, quinces, apricots, cherries, grapes, peaches, nectarines, plums, raspberries, blackberries, loganberries, strawberries, beans, black-eyed peas, celery
Dieldrin	0.1	Apples, pears, quinces, apricots, cherries, peaches, nectarines, onions.
EPN	3	Apples, pears, quinces, apricots, cherries, citrus fruits, peaches, nectarines, pineapples, plums, raspberries, blackberries, loganberries, strawberries, corn, lettuce, spinach, turnips, beans, black-eyed peas, beets.
Forbam	7	Apples, pears, quinces, apricots, blueberries, (huckleberries), cherries, cranberries, currants, dates, gooseberries, grapes, guavas, mangoes, papayas, peaches, nectarines, plums, raspberries, blackberries, loganberries, beans, black-eyed peas, beets, broccoli, cabbage, brussels sprouts, kohlrabi, cauliflower, collards, carrots, celery, cucumbers, eggplants, kale, lettuce, melons, mustard greens, onions, peanuts, peas, peppers, pumpkins, radishes, squash, tomatoes, turnips
Fluorine compounds	7 of combined fluorine	Apples, pears, quinces, apricots, blueberries, (huckleberries), citrus fruits, cranberries, grapes, peaches, nectarines, plums, raspberries, blackberries, loganberries, strawberries, beans, black-eyed peas, beets, broccoli, cabbage, brussels sprouts, kohlrabi, cauliflower, carrots, corn, cucumbers, eggplants, kale, collards, lettuce, melons, mustard greens, okra, peanuts, peas, peppers, pumpkins, radishes, squash, tomatoes, turnips
2-Heptadecyl glyoxalidine	5	Apples, pears, quinces, cherries, raspberries, blackberries, loganberries.
Lead arsenate	7 of combined lead	Apples, pears, quinces, apricots, blueberries (huckleberries), cherries, cranberries, currants, gooseberries, grapes, mangoes, peaches, nectarines, strawberries, asparagus, celery, eggplants, peppers, tomatoes, avocados
Lead arsenate	1.0 of combined lead	Citrus fruits (grapefruit, lemons, oranges, tangerines)
Magnesium arsenate	3.5 of combined As_2O_5	Beans, black-eyed peas
Methoxychlor	14	Apples, pears, quinces, apricots, cherries, cranberries, grapes, peaches, nectarines, pineapples, raspberries, blackberries, loganberries, strawberries, asparagus, beans, black-eyed peas, beets, broccoli, cabbage, brussels sprouts, kohlrabi, cauliflower, corn, cucumbers, eggplants, kale, collards, lettuce, melons, mushrooms, peas, peppers, pumpkins, radishes, squash, tomatoes, turnips
Naphthalene acetic acid	1	Apples, pears, quinces
Parathion	1	Apples, pears, quinces, apricots, avocados, cherries, citrus fruits, currants, dates, figs, gooseberries, grapes, guavas, mangoes, peaches, nectarines, pineapples, raspberries, blackberries, loganberries, strawberries, artichokes, beans, black-eyed peas, beets, broccoli, cabbage, brussels sprouts, kohlrabi, cauliflower, carrots, celery, corn, cucumbers, eggplants, kale, collards, melons, mustard greens, okra, parsnips, peas, peppers, pumpkins, radishes, spinach, squash, Swiss chard, tomatoes, turnips
Phenothiazine	7	Apples, pears, quinces
Sodium arsenate	3.5 of combined As_2O_5	Grapes

(Continued on Page 135)

Pesticide Tolerance Regulations Issued

Proposed Tolerances Subject To Review

THE schedule of tolerances just released by the Food and Drug Administration, it is emphasized, is tentative,—not final. The proposals are subject to review and change. They were necessarily based on data presented in the 1950 hearings, and as a result do not reflect the findings of experimental work since that time. In a statement emphasizing this point, L. S. Hitchner, executive secretary of the National Agricultural Chemicals Association, noted that "many of these pesticides are registered for use with USDA on a greater number of crops, today, than in 1950 because much more data has been accumulated on uses."

He explained further that the proposed tolerances do not affect the additional uses for which product-registration is in effect with USDA. He said that tolerances for these additional uses can be expected to be proposed later.

THE long-awaited regulations setting tolerances for permissible pesticide residues on fresh fruits and vegetables were released by the U. S. Department of Health, Education and Welfare, October 20. The proposed regulations are in two parts, the first section proposing tolerances for a group of pesticides in common use, and the second setting up operating procedure under the new Miller pesticide chemicals amendment to the Federal Food, Drug and Cosmetic Act. In connection with the proposed tolerances, based on data developed at hearings held by the U. S. Food and Drug Administration back in 1950, sixty days are allowed for parties who appeared at the hearings to file exceptions to the suggested schedule of tolerances. On the proposals for operating procedure, a like time is allowed for interested persons to submit their views in writing, and to request a hearing if desired.

The proposed schedule of permissible tolerances provides that no residues of the following pesticides shall be allowed to remain on fruits or vegetables:

- Calcium cyanide
- Dinitro-O-sec. butylphenol
- Dinitro-O-cresol
- Hexaethyl tetraphosphate (HETP)
- Tetraethyl pyrophosphate (TEPP)
- Hydrocyanic acid
- Mercury-containing compounds
- Nicotine and nicotine-containing materials
- Selenium and selenium-containing compounds

Some of these compounds, calcium cyanide and hydrocyanic acid, for example, are applied to crops at such time in their growth, or are dissipated so rapidly after application that a zero tolerance will have little or no effect upon the manner in which they are employed in agriculture. Others, such as the mercury and selenium compounds, if employed at all, must be used with unusual care to keep the finished crops from bearing any residues when marketed.

The tolerances based on the 1950 hearings do not take into account technological and research advances made since that time but are subject to change under the procedure of the new amendment. New scientific data relating to the safety of any pesticide could be filed in the form of an application for a new tolerance.

In a number of cases the evidence received in the 1950 hearings was not sufficient to permit the establishment of a satisfactory tolerance. Applications to establish tolerances for these pesticides, and for any new pesticide chemicals, or to revise existing tolerances, would be processed under the new Miller amendment. Zero tolerances would be set whenever it is found that any amount of residue of a pesticide, however small, would be unsafe for consumers, or where there is insufficient data to establish safety.

The proposed regulations under the new law would:

1. Set up exemptions for a group of common pesticides which are entirely safe when properly used on growing crops. These are: common copper compounds (except those containing arsenic); petroleum oils; pyrethrum, rotenone, and four synergists used to enhance their effects; ryania, and sabadilla. The latter two, like pyrethrum and rotenone, are insecticides derived from plants. The exemptions do not apply when this group of materials is used at time of harvest or after harvest.

2. Establish operating procedures and fees to make administration of the new law self-supporting. The proposed application fee for a new tolerance is $500 and for extending a tolerance to additional crops, $140.

3. Set up procedure for the appointment by the department of experts selected by the National Academy of Science to committees to advise the Department in regard to controversial scientific questions arising in the establishment of tolerances. The cost of an advisory committee would be paid by the person requesting that it be appointed.

Under the new law, the Secretary of Agriculture is required to certify whether a pesticide chemical is useful in agricultural production before the Secretary of Health, Education, and Welfare is required to act upon a petition to set up a tolerance for that chemical.

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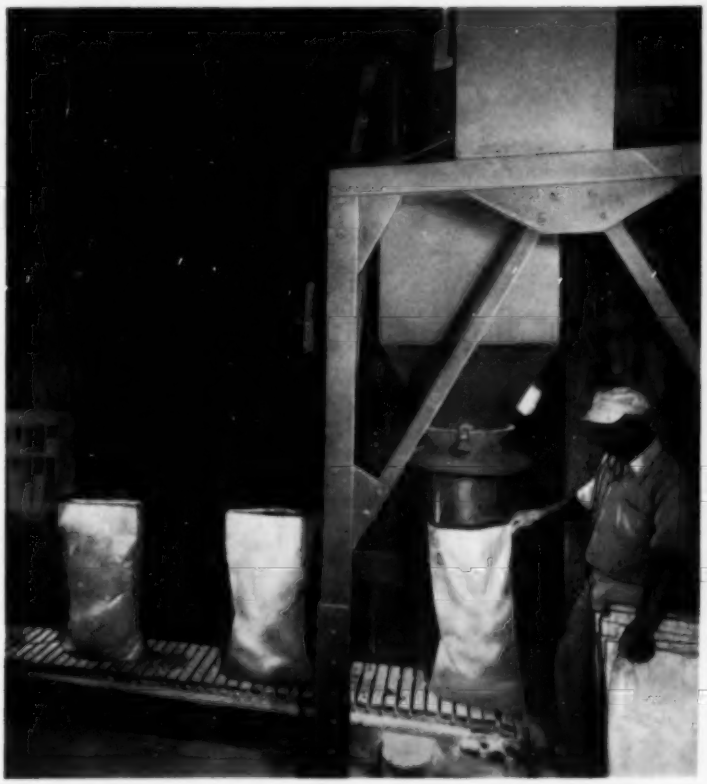
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CASE HISTORIES SHOW WHY MANY USERS ARE ORDERING ADDITIONAL EQUIPMENT

Approximately 40% of the packing plants who have installed one machine have reordered one or more I & C Baggers for either the same plant or other branches.

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Installation of an I & C Bagger enabled a small southern fertilizer plant to save $50 a day by reducing man power and increasing production.

PLANT ORDERS 11 MORE

A large plant food company which had installed an I & C Bagger was so pleased with the test that the company has installed ten additional units throughout its various branches, and recently has ordered two more.

CONVERT EIGHT ADDITIONAL PLANTS

A company which last fall converted one of its plants to a sewn open mouth operation, using an I & C Bagger for its weighing and filling, has since converted eight of their other plants. This company has saved $7.00 per thousand in its bag cost alone. It has also claimed additional business by being able to move its trucks from the loading dock with more speed than ever before.

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LISTENING *Post*

Fungicide Control of Club Root of Cauliflower

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, U. S. Department of Agriculture, Beltsville, Md.



By Paul R. Miller

LEO Campbell, of the Western Washington Experiment Station, writes that measures commonly recommended for the control of club root, (*Plasmodiophora brassicae*), including the addition of lime or lime plus calomel to the soil, or rotation with non-cruciferous crops accompanied by the eradication of cruciferous weeds, have not generally proved satisfactory in western Washington. Therefore, different approaches to control were investigated.

In preliminary tests in the greenhouse and in field plots, various fungicides at different concentrations and amounts were used as dips, drenches, and soil treatments. In 1953, the materials and methods of application found most promising in the preliminary tests were used in an experiment which ran from June 9 to September 9. Fungicides were applied as a drench or mixed with the soil in three replicates of a 27-foot row of 18 plants each. With the former method, 100 cc of each drench was added to the soil around each plant at planting time. For soil mixing, materials were rototilled into the soil to a depth of 4 to 6 inches in strips about 15 inches wide one week before planting. Five- to six-week-old cauliflower plants were used as the host crop. The soil of the plot is a sandy loam, which was kept at the proper moisture content by overhead irrigation. A 10-20-20 fertilizer was added as a side dressing at the rate of about 400 pounds per acre immediately after planting. For the control of the cabbage maggot, heptachlor was used at a concentration of 2% of each drench and at the rate of 2 pounds per acre with each soil treatment, and alone at the same rate in the check. The data from this plot are presented in Table 1.

Of the materials used as drenches, thiram gave the greatest reduction in club root and the highest increase in yield. Mathieson 275 (pentachloronitro benzene) at all three rates, however, gave better control of the disease and greater increase in yield than any other of the fungicides with either method of application. The disease ratings and yields corroborate the observed vigor of the plants throughout the plot. Plants grown in soil treated with Mathieson 275 were as thrifty as would be expected if they had grown under the same conditions, but free of the club root pathogen.

Weeds in the plot were neglected until about two weeks after the soil treatments were made. At this time a low incidence of weeds was noticed in the rows where Mathieson 275 was used at rates of 40 and 60 pounds per acre, in comparison with the rest of the plot. The weeds were then removed between the rows, leaving a strip about one foot wide in each row. On August 8, the weeds from all three of the replicates of these two treatments and the untreated check were removed and weighed. Results are shown in Table 2. The data suggest that economical control of weeds can be obtained from the use of Mathieson 275 at rates of 40 and 60 pounds per acre. No other data on weeds were taken, since no differences were noticed among the other treatments.

None of the treatments used for club root control completely protected the plants from infection. The control obtained resulted from reduction or delay in infection of the roots. Plants with a low disease-index rating showed only small firm clubs restricted primarily to the periphery of the root system, while on those with a high index rating almost all of the branch roots were destroyed, leaving only large central clubs, generally in an advanced state of decay.

In most of the treatments there was a positive correlation between the reduction in disease rating and increase in yield, sometimes the results were inconsistent. Some treatments reduced the disease but failed to increase the yield because the material possessed both high fungicidal and high phytotoxic properties. The only chemical that gave both a substantial reduction in disease rating and large increases in yields, as compared with the untreated check, was Mathieson 275 rototilled into the soil to a depth of 4 to 6 inches in strips about 15 inches wide one week before planting at the rates of 20, 40, and 60 pounds active ingredient per acre. Since practically all of the cauliflower heads from the rows treated with Mathieson 275 were marketable, in contrast to none marketable from the untreated rows, the percentage increase in yield of the former over the latter is much greater than is indicated in Table 1. An additional ad-

vantage of Mathieson 275 used at the two higher rates is the apparent control of annual weeds, sufficient to make weeding within the rows unnecessary. This material, however, has not yet been approved by the U. S. Food and Drug Administration. Until it is, it will not be recommended in western Washington for use on crops for human or livestock consumption.

Results of Vegetable Seed Treatments in Louisiana

W. J. Martin and J. G. Atkins, of the Louisiana Agricultural Experiment Station, report results of tests made during the winter of 1952-53 to study the effectiveness of various newer chemicals recommended for vegetable seed treatment by the manufacturers. The seed (untreated), furnished by Northrup, King and Company, included Detroit Dark Red beet, Danver Half Long carrot, Black Beauty eggplant, Thos. Laxton and Alaska pea, Southern Curled Giant mustard, California Wonder pepper, White Icicle radish, Nobel spinach, and Marglobe tomato. For each of the four replicates, 200 seeds were counted, except that 100 were used for the pea varieties and 150 for eggplant and radish.

The fungicides used and the results obtained are reported in Table 3. According to the different crops

TABLE 1

Disease rating, percent reduction in rating, yield of cauliflower heads, and percent increase in yield for each of 10 fungicides applied at different rates and by different methods; Western Washington Experiment Station, 1953

Treatment, rate or concentration,[a] method of application		Total of three replicates			
		Disease		Yield	
		Rating[b]	Percent decrease[c]	Number pounds	Percent increase[c]
Untreated check		179	—	30.2	—
Fungicide Applied as Drench — 0.25%					
Ferbam		181	—1.1	42.4	40.6
Thiram		121	32.4	49.9	65.2
Captan		139	22.3	41.0	35.7
Streptomycin		164	8.3	37.6	24.4
Fungicide Mixed into Soil—lbs. / acre					
Mathieson 275	20	63	64.8	69.6	130.4
	40	57	68.1	83.7	177.1
	60	55	69.2	95.1	214.9
	10	178	0.0	35.1	16.2
Stauffer N-521	20	175	2.2	55.7	84.4
	30	160	10.6	58.4	93.4
	20	145	18.9	48.1	59.6
Mathieson 1194	40	153	14.5	66.5	120.2
	60	137	23.4	42.2	39.7
	10	162	9.5	30.2	0.0
Mathieson 1197	20	173	3.3	32.2	6.6
	30	144	19.5	15.8	—47.6
	10	128	28.5	42.7	41.3
Penn. Salt NP-1083	20	124	30.7	48.2	59.6
	30	94	47.4	32.3	6.9
	40	139	22.3	40.9	35.4
Calcium cyanamide	80	214	—19.0	41.6	37.7
	100	188	—5.0	43.9	45.3
L.S.D. at 5% level		24.46		7.49	

[a] Concentration and weight based on active ingredient.
[b] Disease rating from 0, no damage, to 5, complete destruction of plant.
[c] As compared with check. Minus sign (—) represents increase in disease or reduction in yield.

TABLE 2

Weight and percent reduction in weed growth from use of Mathieson 275, 40 and 60 pounds per acre, in comparison with the untreated check

Treatment lbs./acre	Weeds from three replicates Weight (pounds)	Percent reduction
Mathieson 275, 40	0.6	99.5
Mathieson 275,60	1.8	98.5
Untreated check	123.0	——
L. S. D. at 5% level	19.40	——

significant features may be summarized as follows:

Beet: All treatments resulted in highly significant increases in emergence over the check. The Spergon and thiram treatments, however, resulted in lower emergence than the other fungicides.

Carrot: No signficant differences between treatments were shown.

Eggplant: Significant increases in emergence over the check were obtained only with Orthocide 75. Spergon gave a highly significant decrease in emergence.

Pea: No significant differences between treatments were obtained with either variety.

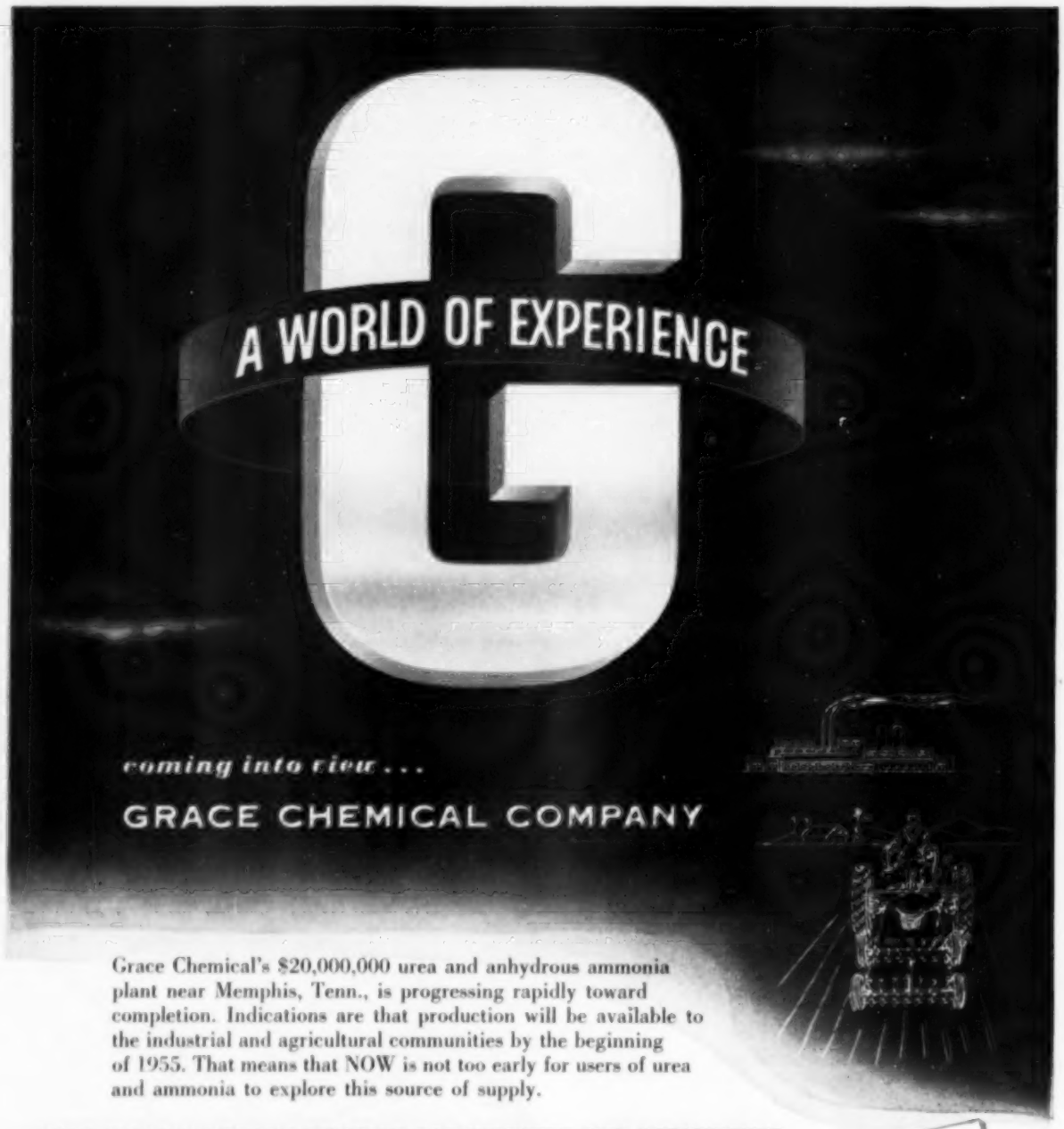
Mustard: All treatments resulted in highly significant increases in emergence, and no differences were evident between fungicides.

Pepper: The Semesan treatment was not significantly different from the check, and the Dow 9 B treatment resulted in a highly significant decrease in emergence. The Spergon treatment resulted in significant increases over the check, while the Arasan, Orthocide 75, Phygon, thiram, and Vancide 51 ZW treatments all resulted in a highly significant increase in emergence.

Radish: The Dow 9 B treatment resulted in a highly significant decrease in emergence. The other treatments were not significantly different from the check.

Spinach: All treatments, with the exception of Orthocide 75, Semesan, and Spergon, resulted in highly significant increases in emergence.

(*Turn to Page* 121)



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Vegetable Insect Conditions This Fall

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Economic Insect Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture, Washington. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the United States.



By Kelvin Dorward

THE lesser cornstalk borer, an insect that occurs from Maine to California but which causes injury primarily in the southern states, was rather active in several southeastern states during late September. In Harnett County, N.C., the insect caused serious injury to the stems of field beans. Moderate to severe injury to snap beans was recorded in the Charleston, S.C., area and replanting was necessary in many cases. Heavy damage occurred in Spalding county, Ga., where at least 90 per cent of the plants were infested. A similar infestation was reported from the Quincy, Fla., area with an anticipated loss of at least 75 per cent of the crops. As far as can be determined, this is the first time pole beans have been damaged at Quincy. In Virginia, this insect was responsible for a 50 per cent reduction of yield in two Sussex county peanut fields. Soybeans were seriously damaged in parts of North and South Carolina. In Texas, 80 to 90 per cent loss of mung bean and cowpea plants were reported from Hardeman county. Grain sorghum was also infested in Hardeman and Midland counties. Light local infestations were also reported on bush beans at Winter Haven, Dimmit county, Tex. The insect was also active on peanuts at Yuma Mesa, Ariz., damaging fruits.

Of particular interest is the report of the European corn borer causing rather severe damage to peppers in Marshall county, Ala. Although the insect has been known to be in several northern counties of the state, this is believed to be the first record of economic damage caused by the insect in Alabama.

Corn earworms, which have been very abundant this season, were continuing to cause damage in various locations. In Grayson county, Va., late snap beans were still being heavily damaged. One field of 15 acres was abandoned without making the second picking. In Idaho, damage was increasing on late canning corn, but not as severe as during the past two years. Severe damage was also reported to sweet corn in Wisconsin and Michigan.

Other vegetable insects, which have been causing damage during recent weeks, include the tomato russet mite, which killed some tomato plants in the Yuma Valley of Arizona before treatments were applied. Medium infestations started in some Ohio tomato canning areas, but developed too late to seriously affect the yield. Other areas reporting the mite during this period were Cumberland and York counties, Pa., and Layton area of Utah. The two-spotted spider mite was very heavy on planting of tomatoes in Cumberland county, Pa. In Indiana, vinegar flies developed to such a problem in some canneries that the canning of tomatoes was discontinued. This situation developed primarily because dry weather caused cracking of the fruit, which provided an ideal situation for egg laying. The infestation developed both in the fields and canneries.

Cabbage caterpillars were active in widely separated parts of the United States. Insecticides were necessary against the imported cabbageworm on collards in the Clarksville, Tenn., area. The same species was unusually abundant on cabbage and cauliflower throughout Wisconsin. Broccoli and cabbage were damaged in Montgomery and Howard counties, Md. The cabbage looper caused damage to collards in Wake county, N.C., Norfolk and Princess Anne counties and the eastern shore of Virginia.

Fruit Insects

THE oriental fruit moth was more numerous in Elberta peaches in Michigan than in several years. This was due to the hot weather which extended into early September. Mid-summer harvested peaches in packing sheds of the Sandhills area of North Carolina were found to be 3 per cent infested after having been treated five, three and two weeks before harvest.

In California, where the oriental fruit moth was first found in 1942, persistent infestations have prevailed only in limited areas in the southern part of the state up to this time. Since early in August, a number of infestations have been reported from Fresno, Kings and Tulare counties. Of particular interest is the very intense outbreak that has developed in the Kingsburg area of Fresno county. Earlier damage was confined to twig terminals of peach trees, while subsequent generations have attacked the fruit. The heaviest infestations centered at a point common to the three counties, the Ernest Peterson ranch in particular. The late cling peach crop (Gaumes) was almost, if not a total loss. Twig damage was severe in old and young trees in the Kingsburg district, while a few plum twigs showed similar damage. A quick survey of the area indicated that the infestation extended south and west from Kingsburg about two miles, eastward to Dinuba, Tulare county, with twig damage gradually decreasing. No such damage was noted in the William Ruppman orchard at north Dinuba where there was an appreciable oriental fruit moth population in 1944, nor was twig damage noted in the J. H. Bigger peach orchard in Parlier, Fresno county, the site of another 1944 infestation. There are rumors of even

(*Continued on Page* 123)

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National Fertilizer Association

to Hollywood, Fla. November 10-12

AN analysis of the farm income outlook and a discussion of organic farming with chemicals will highlight the annual fall meeting of the National Fertilizer Association at the Hollywood Beach Hotel, Hollywood, Fla., November 10-12.

Added features will be previews of the Association's two new sound-color motion pictures now nearing completion. Titles of these new pictures are "Weather or Not" and "The Big Test." The NFA will also have ready its new book on "The Care and Feeding of Garden Plants," published in cooperation with the American Society for Horticultural Science. First copies are expected to be off the press November 10th.

Featured speakers at the meeting will be Oris V. Wells, administrator, Agricultural Marketing Service, USDA, who will discuss "Farm Income in the Years Ahead; and Dr. Richard Bradfield, Department of Agronomy, Cornell University, Ithaca, N. Y., who will raise the question of the desirability or feasibility of maintenance of organic matter in the soil under conditions where commercial fertilizers are available in plentiful supply.

The convention will open Wednesday, November 10, with a luncheon business meeting of the board of directors. A buffet luncheon and fashion show is planned for the ladies the same day.

The first general session will begin at 10:00 a. m. Thursday, November 11, with Mr. Geoghegan presiding. Features of this session will be the annual report of president Russell Coleman, in which he will review current and future activities of the association, and the premier showing of NFA's new motion pictures. This will be followed by a business meeting. Convention sessions will end at noon each day. A "shopping special" to Lincoln Road in Miami Beach is planned for the ladies Thursday afternoon.

The Thursday evening program, which features the convention banquet, will begin with a convention-wide cocktail party sponsored by H.

(*Continued on Page* 135)

NFA PROGRAM

TUESDAY, NOVEMBER 9

8:00 P.M. Registration Begins

WEDNESDAY, NOVEMBER 10

9:00 A.M. Registration

12:30 P.M. Meeting of the Board of Directors

12:30 P.M. Ladies Luncheon and Fashion Show

THURSDAY, NOVEMBER 11

10:00 A.M. General Session
E. A. Geoghegan, Southern Cotton Oil Co., and chairman of the Board of the National Fertilizer Association, presiding.

Invocation
Rev. Robert Excell Frey, Hollywood, Fla.

Annual Report
Russell Coleman, president, National Fertilizer Association

Premier showing of new NFA films
Business meeting

2:00 P.M. Ladies "Shopping Special" to Miami Beach

6:00 P.M. Cocktail party.
Courtesy of H. J. Baker & Bro., New York.

7:00 P.M. Convention Banquet

9:15-1:00 A.M. Aquatic show followed by dancing.

FRIDAY, NOVEMBER 12

10:00 A.M. General Session
Chairman, E. A. Geoghegan

"Organic Farming with Chemical Fertilizers." Dr. Richard Bradfield, Department of Agronomy, Cornell University, Ithaca, N. Y.

"Farm Income in the Years Ahead." Mr. Oris V. Wells, Agricultural Market Service, U. S. Department of Agriculture

12:00 P.M. Adjournment.



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Plant Hazards, Accident Prevention, Reviewed at Fertilizer NSC Meet

MEMBERSHIP in the National Safety Council's fertilizer section increased 500 percent during the past year, the section's general chairman, Vernon S. Gornto, manager, insurance department, Smith-Douglass Co., Norfolk, Va., reported at the annual meeting in Chicago, Oct. 18. This, Mr. Gornto said, is the largest record of growth of any of the Safety Council's thirty odd industrial sections ever reported.

"We are still far from satisfied," he quickly added. Starting with only three member companies at the first meeting in 1951, he related, another nine were added in the next two years, and at this year's Chicago meeting the membership stood at sixty member companies. There are, however, 1,225 fertilizer companies in the U. S. and Canada, thus leaving much membership work to be done. He expressed the hope that during 1955 the section would grow to at least 150 member companies.

More than 200 fertilizer industry leaders, representing top management, production men, safety directors and others, were in attendance at the section's fourth annual meeting in the LaSalle Hotel. They formed a part of an army of some 12,000 who were in Chicago that week for the National Safety Council's 42nd annual National Safety Congress.

Reviewing the fertilizer section's achievements during the year, Mr. Gornto spoke of the data sheet on anhydrous ammonia which has been widely commended. Eight other similar data sheets are in preparation, he said, each dealing with accident hazards peculiar to fertilizer manufacture and giving suggestions on how to prevent them.

"It is most certainly true," he said, that safety is now considered—not as a necessary evil, but as an important adjunct to stabilized production and also, very important from the standpoint of profits to all fertilizer manufacturers everywhere."

Looking to the future, Mr. Gornto announced the drafting of a "Three-Year Plan," to guide the section's activities through 1957. The section, he said, is the only one within the National Safety Council to make detailed and specific plans for such a long period.

Another "first" for the section, he said, is the addition of a Research Committee to the list of standing committees. A third "first" is the initiation of an "Employees Motivation Field Study," to develop knowledge of the learning processes and motivations and work habits of the average fertilizer industry laborer, so that safety training aids produced for them will have maximum effectiveness.

He also reported organization of a third state fertilizer section in South Carolina. Its first meeting, he announced, is to be held at Spartanburg, S. C., Nov. 19, during the S. C. Annual Accident Prevention Conference.

Closing his report, Mr. Gornto appealed for cooperation in the fight to make the fertilizer industry "a safer place in which to work."

T. J. Clarke New Section Chairman

ELECTION of section officers for next year resulted in selection of the following: General Chairman, Thomas J. Clarke, personnel director and comptroller, G.L.F. Soil Building Service, Ithaca, N. Y.; vice chairman, Curtis A. Cox, Virginia-Carolina Chemical Corp., Richmond, Va.; secretary, E. O. Burroughs, F. S. Royster & Co., Norfolk, Va. Retiring chairman Gornto was added to the executive committee and twelve others were elected to three-year terms to fill vacancies. John E. Smith, Spencer Chemical Co., Pittsburg, Kans, was chairman of the nominating committee which submitted the slate of new officers to the meeting.

"Reaching the Worker with the Safety Program," was the subject of the section's first formal paper, by Dr. Charles W. Nelson, Industrial Relations Center, of the Univ. of Chicago. Dr. Nelson has been retained to conduct the employee motivation field study announced by Mr. Gornto.

The problem of reaching the worker, Dr. Nelson said, has three phases: (1) Is the individual worker the cause of accidents?; (2) What is the role and function of management and training?; (3) What is the status of the industry setup for dealing with accidents?

Introducing an accident prevention program into the fertilizer plant, Dr. Nelson continued, is a challenging situation. While fertilizer manufacture has long been considered a "marginal" industry, it is fast becoming an essential and well stabilized business. But mechanical equipment, the chemicals involved and personnel requirements are changing. There is thus great need for a long look ahead to determine where the industry is going. The available labor is, for the most part, unstable and uneducated, so that it lacks a lot of things through which the safety appeal is commonly relied on to reach the worker.

Even though autocratic administration of accident prevention programs is not as satisfactory as the democratic appeal to the spirit of teamwork, he recommended that any program set up within a company be conducted under firm autocratic supervision. The motivation study to come, he said, will attempt to set up guide lines to get the action program under way.

Describing what fertilizer plants in North Carolina are doing on accident prevention, W. C. Creel, safety director, North Carolina Dept. of Labor, Raleigh, N. C., said that in 1952, when the statewide accident reduction program was started, the frequency rate for this industry was 18.2. Next year it dropped to 16.6 while for the first six months of 1954, the rate was 11 accidents per million man-hours worked. How this 40 percent reduction in the accident rate has been accomplished was described.

(*Continued on Page* 109)



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Technical SECTION

Methoxone, Dalapon Used on Western Rice Fields*



Field of rice being examined for weeds by J. Baker of Baker Bros., P. V. Harrigan, Glenn County agricultural commissioner and Mr. Jensen, of Dow Chemical Co.

2, 4-D, which has been used in large volume for the control of weeds on rice fields on the West coast, has been replaced recently with several of the newer chemicals. Although, 2,4-D is effective in control of many of the rice weed problems, a prime objection is damage of adjacent sensitive crops by drift in aerial application. K. Ingebretsen, county advisor of Colusa, Calif., recently presented a report at the California Weed Conference, in which he indicated that MCP (methoxone) is less injurious to rice than 2,4-D, and is just as effective on weeds. County advisor Miller (Glenn County) indicated that the same rates per acre were suggested for both MCP and 2,4-D.

Both agents indicated that on the hard-to-kill sedges, nut grass, bullrushes, etc., 24 ounces per acre is adequate, plus one quart of light summer oil; while on such easy-to-kill weeds as arrowhead lily and red steam, 16 ounces per acre is recommended.

*Based on material sent by H. Higgins, Los Angeles, following a visit to the California rice fields.

Still another new weed control material gaining increased interest on the west coast is Dalapon, which is being applied to alfalfa fields for the control of water and pigeon grasses.

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Weathering of Insecticides

Laboratory cage experiments were conducted to determine the effect of wind on the toxicity of emulsion sprays of toxaphene, dieldrin, and endrin when used to control the boll weevil. Similar experiments were also conducted to determine the effect of wind on the toxicity of toxaphene, aldrin, dieldrin and endrin when used to control the salt-marsh caterpillar. The results from the experiments with these two insects were strikingly similar. Simulated wind reduced the toxicity of toxaphene more than of the other materials tested. However, in the absence of wind the toxicity of toxaphene was reduced less than any of the other insecticides used. Wind, therefore, appeared to be the most important climatic factor studied which reduces the toxicity of toxaphene. Wind was not an important factor in reducing the toxicity of aldrin because aldrin lost its toxicity very rapidly even in the absence of wind. The toxicities of dieldrin and endrin were reduced appreciably by simulated wind. Both the immediate and residual toxicity of endrin was slightly superior to that of dieldrin. An increase in wind movement was found to decrease slightly the toxicity of insecticides, at least within the range of wind velocities tested.

By W. J. Mistric, and J. C. Gaines, *J. Econ. Ento.* 47,#4,646-650.

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Rotenone Clears Lakes

The removal of "trash fish" infesting lakes has been accomplished effectively in Oregon with two forms of rotenone: powdered cube or liquid "Noxfish", both of which are supplied by S. B. Penick & Co., New York. Some 200,000 lbs. of the powder were used on Diamond Lake in Oregon. The insecticide kills by constricting the capillaries, which carry oxygen from the gills, causing suffocation. Since all fish are killed with these compounds, lakes need later to be restocked with desired game fish.

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HNH_3 as a Soil Conditioner*

Most organic compounds are soluble in anhydrous ammonia. Ammonia is also a dispersion medium for many organic compounds. Thus when anhydrous ammonia is injected into the soil, it will dissolve organic matter, and redistribute it sufficiently on the surfaces of the mineral soil particles, to form "water-stable" aggregates or granules; thereby improving the structure of the soil.

The factor which favors the soil conditioning effects when anhydrous ammonia is injected into the soil is the organic matter content; either a larger amount of old organic matter, or some lesser amount of fresh, active organic matter. Accordingly, any type of farming, or method of soil management which adds to the organic matter content of the soil, increases the soil conditioning effects and values of anhydrous ammonia.

*A. M. Smith, Mathieson Chemical Corp., at the Anhydrous Ammonia Conference, August, 1954.

Control of Corn Rootworm

Heptachlor, aldrin, gamma isomer of BHC. dieldrin, and probably endrin and isodrin, are about equally effective, pound for pound, for control of corn rootworm. Chlordane appears to be a little less effective, while toxaphene at the same rate of application appears to be considerably less effective.

Five methods of application not previously tested were successful or promising when used for the first time in 1953. These were: (a) broadcast spraying followed by disking prior to spring plowing, (b) spraying over planted rows before emergence and harrowing crosswise to retain the spray residues, (c) broadcast spraying and disking in before planting with a lister, (d) low-gallonage spraying by air followed by rotary-hoeing, and (e) aldrin applied by different procedures on ridge-planted corn.

Aldrin, heptachlor, dieldrin, and chlordane when sprayed broadcast on plowed land at 5 pounds per acre and disked in, gave significantly less rootlodging and significantly higher yields than the untreated plots in the year of application (1952), and also a year later without additional treatments.

Good commercial control of severe rootworm infestations and large increases in yield were obtained with surface applications of heptachlor, endrin, BHC and aldrin disked in and plowed under in the spring.

Significant reductions in rootworm numbers and root-lodging were obtained in listed corn where the planting was preceded by broadcast spray applications of gamma isomer of BHC, heptachlor and aldrin, respectively, at 1 pound per acre, broadcast and disked in. Banding low-gallonage sprays over the planted rows and harrowing in gave good commercial control with heptachlor, endrin, isodrin, aldrin or chlordane.

Starter fertilizer mixtures containing aldrin, heptachlor, or chlordane in 30-60 mesh granulated *Attaclay* formulations gave commercial control of a light rootworm infestation, but less effective than anticipated.

Commercial control of rootworms was obtained with 1 pound of aldrin per acre applied to ridge-planted corn by three different procedures, and on regular surface-planted corn by one method.

By J. H. Lilly, *J. Econ. Ent.*, 47, #4, 651-657. (1954).

Apple Maggot Fly Control

The toxicity of new insecticides to adult apple maggot flies was reviewed recently by R .W. Dean, of the New York Experiment Station, Geneva, N.Y. Screening tests were made both in the laboratory and in the field at the station's Hudson Valley Fruit Investigations Laboratory at Poughkeepsie, N.Y.

In laboratory tests, 90 per cent or more of the flies exposed for 24 hours to a 3-day old parathion residue were killed, while DDT residues were equally effective for 7 days.

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Dowfume for Alfalfa

Use of a soil fumigant, Dowfume W-40, at 15 gallons per acre on a Norfolk loamy sand, gave an average increase of about 300 lbs. of alfalfa hay per acre in 1951 and an increase of about 500 lbs. per acre in 1952, over plots receiving no fumigant. This fumigant, according to the annual report of the Alabama Agricultural Experiment Station, offers promise of increasing the longevity of alfalfa stands on light sandy soils.

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Manzate Control Results

Rio Grande Valley spinach yields have been boosted an extra 10 per cent in blue mold control tests with "Manzate" maneb fungicide, according to figures released by E. I. du Pont deNemours & Co., manufacturers of "Manzate." This material has also proved effective against each of the three major fungus diseases affecting tomatoes in south Texas—early blight, late blight and gray leaf spot. Manzate is reported also to show promise for control of both downy and powdery mildew on cantaloupes.

TCA and PCP for Beets

Wisconsin Agricultural Experiment Station is advising red beet growers who have been using the weed killer "TCA" that they will get better results if they mix this compound with "PCP."

In the past TCA has been very good for killing grassy weeds, but L. G. Helm of the station staff says that a better kill of several kinds of weeds, including serious broadleaf varieties, can be obtained by a mixture of 10 lbs. of TCA and 4 lbs. of PCP in 40-50 gallons of water to spray an acre. Spray the field 3 days before planting, he says, but he warns that use of the mixture should be limited to muck soils, not to upland soils, where it can cause injury to beet plants.

In last year's tests, the Wisconsin station's report for 1953 indicates that the TCA-PCP mixture controlled 66 per cent of the weeds, and the plots averaged 25,526 lbs. of beets per acre. Where TCA alone was used, it controlled only 39 per cent of the weeds, failed to kill several serious weeds, and beet yield was only 23,179 lbs. per acre.

Use of a "1-shot" systemic insecticide on peas is "not very practical," another progress report by J. W. Apple and R. L. Martin says. Systemics have not yet been approved for peas, but, since they do not wash off in a rain, the possibility that one spray a year might do against certain insect pests of peas was investigated.

This study involved three questions: (1) how much chemical must the plant contain for good insect control during the growing season?; (2) how long does a certain concentration of insecticide remain in a plant?; (3) how much chemical will the edible part of the plant contain at harvest time? Demeton, sold under the trade name of Systox, was used in the tests.

For 100 per cent control of aphids, the tests showed that pea plants had to contain at least 16.5 parts per million of Systox. For 90 per cent control, which is generally considered satisfactory, 3 ppm. in the plant was enough. With all of

the treatments, there was a trace of insecticide in the peas at harvest.

So far, comments the report, nobody has determined the "safe" level of insecticide in a crop which is to be fed to livestock or consumed by humans. Other data detail what the tests showed about aphid control and insecticide residues in plants sprayed with varying dosages and at various stages of maturity.

From these tests, the report concludes, "It does not look as though a 'one-shot' spray treatment will work on peas with this systemic insecticide."

In an investigation of soil build-up of some insectcides on which R. K. Chapman reported at some length, it was concluded that "there seems to be little danger that insecticides could build up in the soil enough to cause any serious vegetable plant damage, when the materials are used according to recommendations."

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Zinc, Lime Advised for Ala. Soils

Alabama farmers are being told by their state agricultural experiment station at Auburn that approximately 40 per cent of the soils on which peanuts are grown in that state would give profitable increases in yield of nuts if they would apply lime or gypsum to their fields. This conclusion is based on field experiments conducted for four years in four southeastern Alabama counties. Lime was applied in every test at the rate of one ton per acre, at least six weeks before planting, and gypsum at the rate of 400 lbs. per acre was dusted on the vines during the early blooming stage. Yield data were obtained for one or more years from 35 localities with a total of 57 yields.

Yield increases of 200 lbs. or more were obtained from lime or gypsum at 21 locations. Twelve locations gave increases in yields of 400 lbs. or more per acre, and four produced increased in yield of 600 lbs. per acre.

Another note in the Alabama station's latest annual review of its activities for the two years ending Dec. 31, 1952, tells how use of zinc sulfate increased corn yields on zinc-deficient soils. Yields obtained from use of 0, 5, 10 and 15 lbs. of zinc sulfate per acre were 29.9, 31.5, 33.7 and 35.4 bushels of corn per acre respectively. Where soil was limed but no zinc applied, yield was reduced to 24.7 bushels per acre. But where both lime and zinc were applied, yield from the same soil increased to 34.5 bushels of corn per acre.

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Fertilizer Study on Cane

A series of experiments on the use of fertilizer for sugar cane have been conducted at the U. S. Sugar Plant Field Station in Georgia over the years 1945-1951. E. S. Lyons, soils technologist, reviews some of the results of this study in Bulletin 54 of the Georgia Coastal Plain Experiment Station. The following results are presented in the report:

1. The largest yield and the greatest return from fertilizer was from a complete fertilizer containing 72 pounds per acre of each of the three nutrients, nitrogen, phosphoric acid and potash.

2. When the nitrogen was supplied at only 36 pounds per acre (4-8-8) the yield was 2.21 tons less per acre than for the 72 pounds of nitrogen.

3. Potash was the most efficient of the three fertilizer elements. Even when used alone, potash was profitable. Any combination of potash with nitrogen or with phosphorus and nitrogen gave good increases and profitable returns.

4. Nitrogen when added with phosphoric acid and potash gave larger and more profitable yields at 72 pounds per acre than at 36 pounds per acre. Nitrogen without potash gave small and unprofitable returns.

5. Phosphoric acid alone or in combination with nitrogen gave very small increases which were unprofitable.

6. There was no advantage in making a split application of fertilizer for sugar cane. If the fertilizer distributing equipment will not handle the full application at the early date, a part of the fertilizer may be applied in May or June with little or no reduction in yield.

Literature Available

The following list reviews a series of bulletins on fertilizer, insecticide and fungicide recommendations, controls, etc. For the most part, these bulletins and reports are prepared by the various state agricultural experiment stations, and copies may be obtained by writing directly to the respective stations.

HERBICIDE LAW MANUAL. Compiled by Jack Dreesen. A summary and reproduction of laws of nine states. NACA, 910 17th St., N. W., Washington, D. C.

WEEDS OF THE NORTH CENTRAL STATES. Publication #36. Illustration and description of more than 200 weeds found in the Northeastern region. F. W. Slife, Agronomy Dept., Univ. of Illinois, Urbana, Ill.

AN INTRODUCTION TO INDUSTRIAL MYCOLOGY by George Smith. Fourth Edition, Published by Edward Arnold (Publishers) Ltd., London. 6 x 9 inches, cloth binding, 378 pages, price $6.00.

THE HALOGENS by Robert C. Brasted. Volume 3. Published by D. Van Nostrand So., New York. 6 x 9 inches, cloth binding, 250 pages, price $5.00.

CONTROL WHITE GRUBS IN LAWNS by R. E. Roselle. Chlorine, aldrin, dieldrin or arsenate of lead are suggested for control of white grubs, with the specification that the lawn be watered thoroughly after application for best results. E. C. 1569. Univ. of Neb. College of Agric.

PRESERVATION OF WOOD BY SIMPLE METHODS by H. W. Hicock and A. R. Olson, 66 pp. Review of methods of treatment, effect of moisture content and seasoning, discussion of phytotoxicity of preservative and solvents. Bulln. 581. Conn. Agric. Exp. Sta., New Haven.

WHEAT FERTILIZATION STUDIES IN WESTERN OKLAHOMA Progress report '51-'52 and '52-'53. By H. V. Eck and R. A. Stewart. Results of tests with nitrogen fertilizer and phosphorus fertilizer on yield of grain and on protein content. Bull. B-432 Agric. Exp. Sta., Oklahoma A&M College, Stillwater, Oklahoma.

ANALYTICAL INDEX OF CHEMICAL ENGINEERING PUBLICATIONS, PATENTS AND REPORTS. Chemical Engineering Report #10 of the Tennessee Valley Authority. A catalogue by subject of publications, patents and internal reports covering a large part of TVA's chemical engineering activities, including reports on rock phosphate, properties of phosphorus, the nitrates, and potassium compounds. Copies available from the superintendent of documents, U. S. Government Printing Office, Washington, D. C. at 55 cents.

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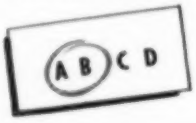


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WASHINGTON Report

by
Donald G. Lerch
Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

FOR the most part, the residue tolerances as proposed by the Food and Drug Administration, can be put into operation with little or no change in farming practices. This is the opinion of some of those who have been closely connected with the problem since it was raised in the late '40's. Furthermore, it's unlikely that it will be necessary to make major changes in labels.

When you get right down to what the tolerances mean for many companies, you come face to face with the label. Here is where the recommendations for use are carried; here is where the caution statement is listed.

It's not intended that the above be considered legal advice or that it represent official statements of government agencies. On the other hand, it seems definite that there will be no major upheaval in the pesticide business during the 1955 growing and selling season, because of the issuance of residue tolerances.

In itself, this is a tribute to the intiative, ability, and patience of both industry and government representatives who have been working on the matter. There have been times in the past when this could not have been said.

Actually, there are two separate actions proposed in the October 20 Federal Register which pertain to residues. The one is composed of proposals to put the Miller Pesticide Residue Admendment, Public Law 518, into operation. The other action is a list and text related to actual residue tolerances for 26 pesticides based entirely on the 1950 hearings.

In the first instance, the National Agricultural Chemicals Association is suggesting that its members carefully study the proposal and advise the Association of their views. It is hoped that any changes or clarifications believed desirable can be brought about by informal conferences and correspondence. If this can be done, it will not be necessary to hold public hearings which would again offer a stage for critics to gain the spotlight.

There's a good deal of talk about the proposed fees which will be charged companies applying for tolerances. In some cases they appear pretty steep. NAC is asking members for their views, with the reminder that any relief would have to come from the Bureau of the Budget and Congress.

It should be noted that other associations and industries are watching the outcome of the matter of levels of fees. For one thing, if the same pattern is followed, other industries could be, as they put it, "hard hit." The general aim of the Administration is to have the costs of special programs such as this paid for by those who are bound by the particular set of regulations. When this is applied to the meat and fruit and vegetable industries, it get pretty complex.

This initial review of the proposals under the Miller Admendment is primarily a job for the technical and legal minds of each company, with the policy makers acting on the basis of individual position. An even bigger job for the technicians is the other part of the Food and Drug action, the issuance of proposed tolerances. This long list of chemicals, crops, and stipulated number of parts per million is, by itself, quite imposing.

This list marks the beginning of the establishment of residue tolerances for fresh fruits and vegetables. A company which find the proposed tolerances not suitable and which took part in the 1950 Hearings can appeal within 60 days. If a company finds the proposals acceptable, it need do nothing more at this time.

In those cases where new data has been developed since the 1950 Hearing, a company may wish to withdraw its chemical from the current proposal and resubmit it under terms of the Miller Admendment. This would probably be done where the proposed tolerance is, in the company's opinion, not acceptable.

You might keep in mind that these proposed tolerances don't interfere with the presently accepted uses of various pesticides which are registered by the U. S. Department of Agriculture. The so called unofficial tolerances, as reflected in recommended practices on the label, are in line with the new proposed tolerances in most cases.

For the pesticide industry, this marks the beginning of a new era where the establishment of a tolerance will give it a method for protecting itself against unwarranted attack.

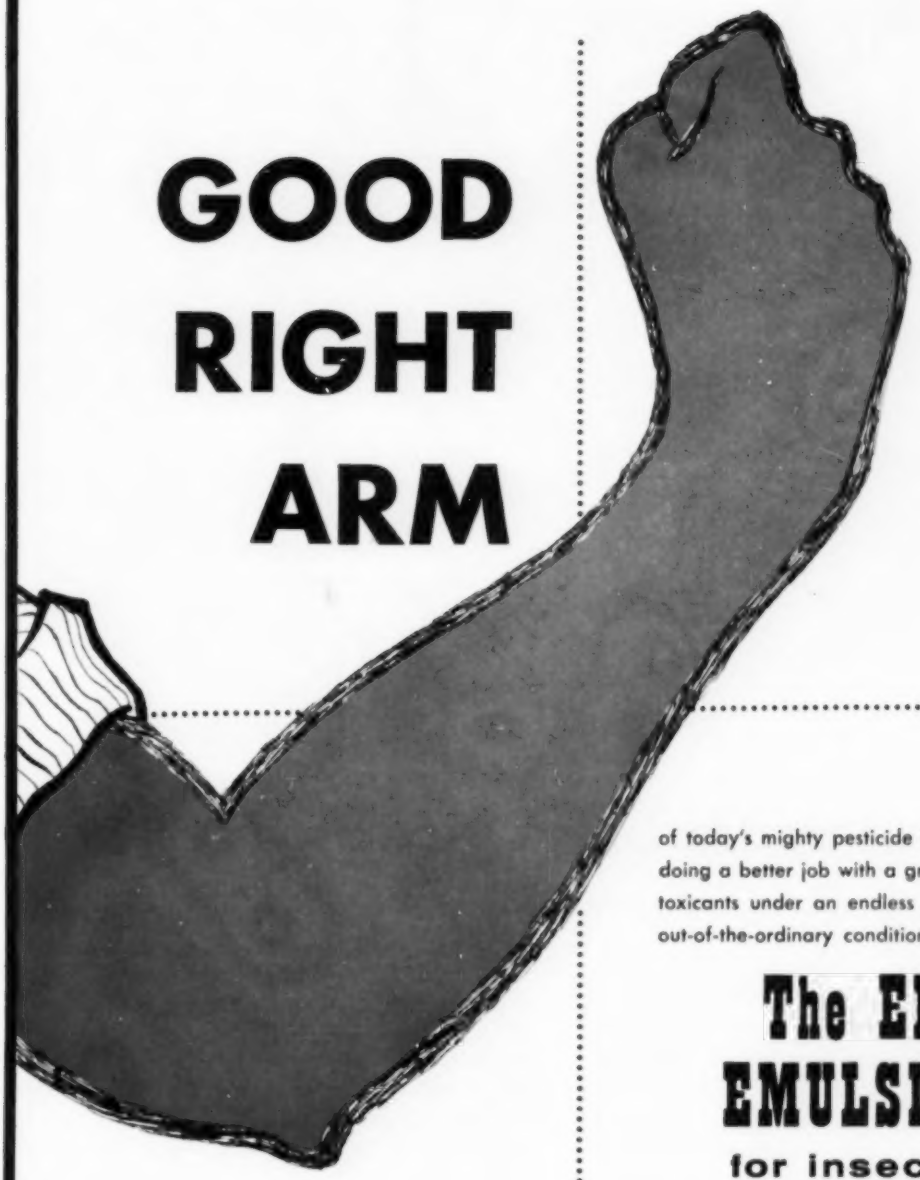
As such, the industry is given new incentive to continue its research and development leading to improved pest control.

Most of the reaction in Washington is casual, underlaid with a strong feeling of confidence that the industry and the Food and Drug Administration are in fundamental agreement and that the differences will be handled within the framework decided in advance, with both working toward the same goal of a food supply that maintains the highest standards of health and safety.

Changes are much in evidence in the fertilizer industry also. The general interest in the merger of the American Plant Food Council and

(*Turn to Page* 114)

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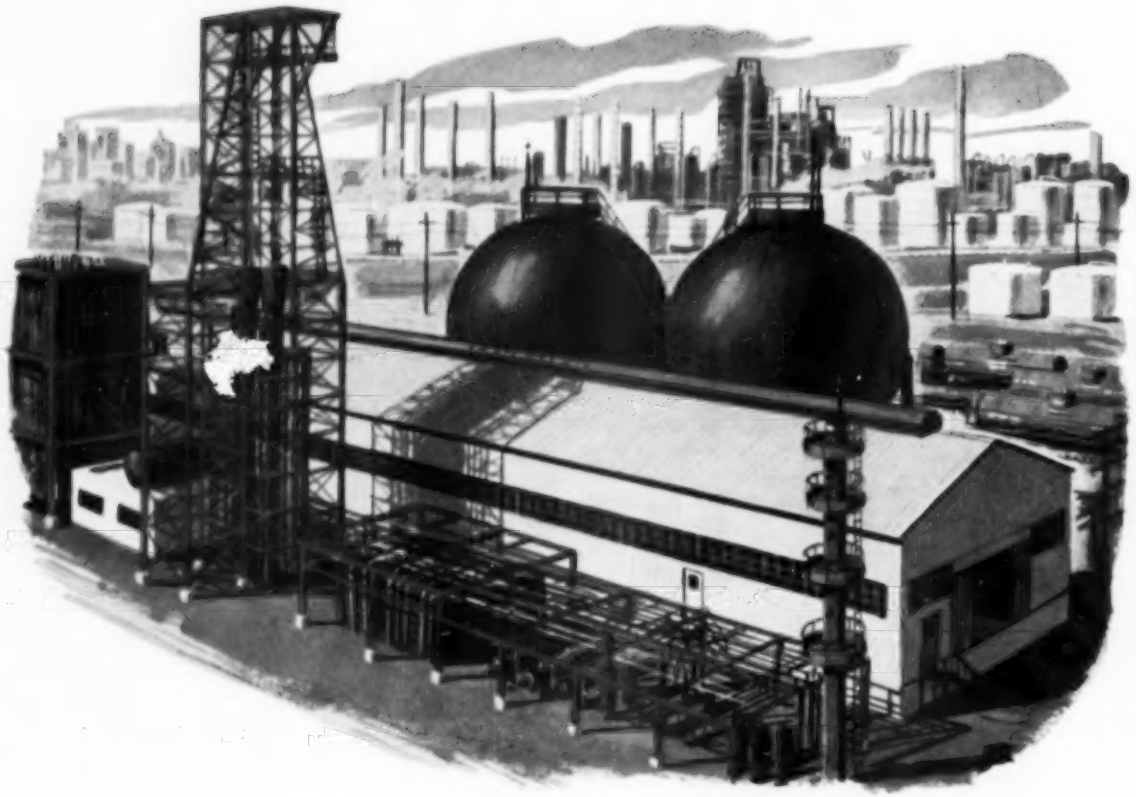
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New Anhydrous Ammonia Plant

Atlantic puts first plant of its type in operation in growing Delaware Valley area

Atlantic has now put into production its new anhydrous ammonia plant. New in conception, it uses high-purity hydrogen from the refinery catalytic reformer. Output from this unit will be available for chemical and agricultural use . . . ranging from the manufacture of synthetic fibers to fertilizers.

This new unit is one more step in Atlantic's modernization program designed to meet the expanded needs of industry for petrochemicals. For detailed information on the constantly growing family of Atlantic petrochemicals, write to any of The Atlantic Refining Company offices listed below or use the coupon.

THE ATLANTIC REFINING COMPANY

Dept. J-11, Chemical Products Sales
260 South Broad Street, Philadelphia 1, Pa.

Please send information on Atlantic petrochemicals. We manufacture such products as

Name _____

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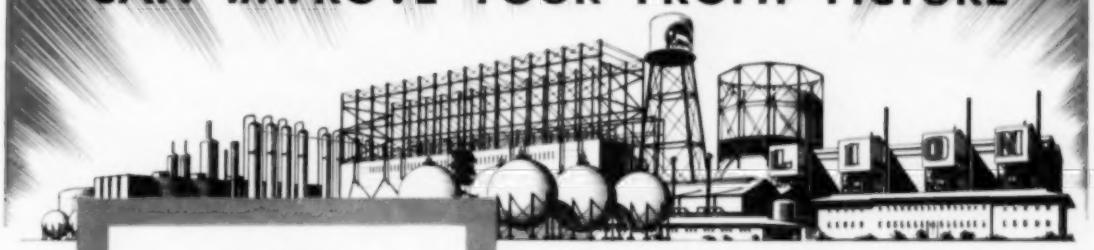
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Lion Anhydrous Ammonia — For formulation. A uniformly high-quality basic product. Nitrogen content, 82.2%.

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Lion Sulphate of Ammonia — For formulation or direct application. Uniform, free-flowing crystals. Guaranteed to contain a minimum of 21% nitrogen.

Because of Lion's leadership in nitrogen fertilizer production in the South, Lion can show you the way to MORE PROFITS.

When you buy your complete nitrogen requirements from Lion, you automatically put yourself in a position to improve your profit picture. Here's how:

1 **You Save Time** • You can contract at one time, with a single dependable source, for all of your nitrogen fertilizer material requirements. And, of course, time saved today is reflected in your profits tomorrow.

2 **You Prevent Manufacturing Delays** • Formulation material that does not have consistent quality can slow down or delay your own production needlessly. With Lion's Quality Control, you can be sure of *quality* materials. The difference will show up in your profit column.

3 **You Solve Problems Quicker** • If you run into a formulation snag, Lion's highly trained Technical Staff will be ready to give you the kind of technical assistance that can only come from a leader. This aid can help improve your profit picture . . . and *it's yours for the asking.*

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LION OIL COMPANY

CHEMICAL SALES DIVISION — EL DORADO, ARKANSAS

INDUSTRY *News*

MGK Names McLaughlin



The Agricultural Chemicals Division, Pittsburgh Coke & Chemical Co., Pittsburgh, announced the advancement of W. T. McLaughlin to manager, special account sales.

Mr. McLaughlin joined the company in 1948 as formulation manager of the agricultural chemicals division. A graduate of Pratt Institute in chemical engineering, Mr. McLaughlin was associated formerly with Naugatuck Chemicals Division, U. S. Rubber Co.

•

USDA Appoints Peterson

Ervin L. Peterson, director of the Oregon State Department of Agriculture, has been named assistant Secretary of Agriculture, succeeding J. E. Coke, who resigned to return to his former position as director of the agricultural extension service in California. The new assistant secretary will be in charge of the Department of Agriculture's work in the field of federal-state relations.

•

Culpepper Addresses NW Meet

Fertilizer is a product which can benefit our entire population, cutting the cost of producing food, and lowering the cost to the consumer, members of the Pacific Northwest Plant Food Association were told by J. Culpepper, Spencer Chemical Co., at the annual meeting in Sun Valley, Idaho, October 5-7. Mr. Culpepper discussing "Sales and Merchandising of Fertilizer," emphasized that the industry has not as yet fully developed the potential of fertilizer distribution.

IMCC Appoints Keller



Raymond W. Keller has been appointed staff production manager of the Plant Food Division of International Minerals & Chemical Corp., Chicago. Mr. Keller was associated formerly with Booz, Allen & Hamilton, Chicago management consulting firm.

•

Phillips Acquires Curry Stock

All of the capital stock of Curry Chemical Co., Inc. and 14 affiliated companies has been acquired by Phillips Petroleum Co., Bartlesville, Okla., according to K. S. Adams, chairman, and P. Endacott, president of Phillips. The Curry companies are engaged in the wholesale and retail distribution of agricultural ammonia and the manufacture and wholesale distribution of mixed fertilizers, and separate fertilizers.

No changes are contemplated in the operations of the companies and they will continue operating as in the past with the present personnel. The Curry properties include about 100 ammonia distributing plants.

•

Eston Names Adinoff

J. Adinoff has joined American Potash & Chemical Corp. as chief engineer of the company's Eston Chemical Division at Los Angeles. He will supervise all phases of engineering in connection with the Eston Chemical Division's production of agricultural chemicals, aerosols, etc.

NFA-APFC Announce Plan To Consolidate

RUSSELL Coleman, president of The National Fertilizer Association, and Paul T. Truitt, president of the American Plant Food Council, on October 21st confirmed that negotiations are now being conducted for the consolidation of the two organizations, and made the following statement:

The Board of Directors of The National Fertilizer Association, meeting in Washington October 19, voted to recommend to the full membership of the Association approval of a proposal for consolidation with the American Plant Food Council to form a new non-profit corporation to be known as the National Plant Food Institute. The proposal is based on the recommendations of a joint committee of the two associations which met in Washington on October 4.

Details of the consolidation plan were distributed to NFA members so that a vote can be taken at the fall meeting to be held in Hollywood, Florida, November 10-12.

The Board of Directors of the American Plant Food Council was scheduled to meet in Washington on October 28 to consider the proposal for consolidation.

•

Chemagro Names Hitchcock

O. B. Hitchcock is a new addition to the sales force of Chemagro Corp., New York. He will represent them on the West Coast.

Shell Reduces Aldrin Price

Shell Chemical announced recently that the price of aldrin has been reduced from $1.00 to $.85 (lb.) on a carload, and $1.05 to $.85 on quantities on less than a carload.

•

Ohio Pesticide Conference

A discussion of a model state pesticide law, together with several reports and reviews on herbicides and defoliants, field crops, vegetable crops, fly control, fungicides, insect resistance, etc, will be featured at the eighth annual school and conference sponsored by the Ohio Pesticide Institute, to be held November 17 and 18th at Neil House, Columbus, Ohio. J. D. Wilson, Ohio Agricultural Experiment Station, Wooster, O., is in charge of arrangements. The full program is as follows:

Wednesday, November 17

Introductory
Remarks ..... Pres. Don Zimmerman
Address of
Welcome ..... Mayor Sensenbrenner
Insect Resistance to
Insecticides ..... C. R. Neiswander
Systemic Fungicides ..... H. C. Young
Discussion of Model State
Pesticide Law ..... Sam Plummer
John Barringer
Herbicides and Defoliants
Vegetables ..... Kenneth Alban
Soybeans ..... L. C. Saboe
Lawns ..... Harmon Runnels
Field Crops
Corn Insects ..... E. T. Hibbs
Forage Insects ..... C. R. Weaver
Diseases ..... Fred Schmitthenner
Vegetables Crops
Insects ..... J. P. Sleesman
Diseases ..... J. D. Wilson
Fly Control ..... Lyle Goleman
General Discussion Period
What Happened at the N. Y. Pesticide Meeting
Engineering ..... Frank Irons
Pesticides ..... Don Zimmerman

Thursday—November 18

Business Meeting
Chairman ..... Don Zimmerman
Fruits
Diseases ..... H. F. Winter
Insects (pome fruits) ..... C. R. Cutright
Insects (stone fruits) ..... Roy Rings
Soil Treatments
C. E. Dieter, Shell Chem. Co.
W. E. McCauley, Shell Chem. Co.
Pest Control on
Ornamentals ..... Ralph Neiswander
Turf
Diseases ..... Harmon Runnels
Insects ..... Joe Polivka
What the Dealer Should Stock
Fungicides ..... B. F. Jansen
Insecticides ..... T. H. Parks
Herbicides ..... H. E. Bruner

WACA Holds 25th Annual Convention



(L to R) D. W. Dean, U. S. D. A., Stanley Strew, Chipman Chemical Co.; Paul Mayfield, Hercules Powder Co.; Charles Barnard, WACA, secretary; and C. E. Cody, California Spray Chemical Corp.

WORK of the Western Agricultural Chemical Association in accomplishing through organization what individual chemical companies could not possibly do alone, was the keynote of a talk by Paul Mayfield of the Hercules Powder Co., Wilmington, at the 25th annual convention of the WACA in Berkeley, California, on October 12.

Mr. Mayfield, who is a past president of NACA, stressed the importance of getting more accurate information about the chemical industry to the public. This could be handled best through the cooperative offorts of WACA and NACA, he said.

Quoting from a letter from Lea S. Hitchner, secretary of the national association, Mr. Mayfield listed as the most important work of the two organizations: Legislative work on some 300 bills affecting insecticides to be introduced during 1955; work on statistical information, product liability, technical progress and information; and public relations.

Other speakers on the program included Stanley Strew, Chipman Chemical Co., Palo Alto, Calif., who is president of WACA; R. T. Rollins, assistant chief of the California State Bureau of Chemistry; and D. W. Dean, western representative of the Pesticide Regulation Section, U.S.D.A.

A panel discussion on the credit situation in the pesticide business was conducted by industry credit men. These included H. S. Dodge, Niagara Chemical Co., Richmond, Calif.; Roger Hunt, Stauffer Chemical Co., San Francisco; Steve Doyle of Pacific Guano Co., Berkeley; John Alexander of Monsanto Chemical Co., San Jose, Calif.; and the panel moderator, Charles E. Cody of California Spray-Chemical Corp.

New officers elected for 1955 are Stanley Strew, re-elected president; Converse York, Shell Chemical Corp., Los Angeles, vice-president; and Charles Barnard, formerly with American Cyanamid Corp., secretary.

•

Grace Elects 2 VP's

William P. Gage and Marlin G. Geiger have been elected vice presidents of W. R. Grace & Co. Both men are members of the board of directors of the company. Mr. Gage is president of the Grace Chemical Co. and Mr. Geiger is president of the Davison Chemical Co., Division of W. R. Grace & Co.



Two past presidents of the NACA get together for a talk at the 25th anniversary meeting of the WACA. At left is Paul Mayfield of Hercules Powder Co. shaking hands with A. W. Mohr, president of California Spray Chemical Corp.

Agricultural chemicals stay fresher longer in thrifty Flav-O-Tainer!



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- **INSECTICIDES**
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PLIOFILM* liner keeps out oxygen, prevents moisture absorption or drying out.

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SHELLMAR-BETNER bag fills smoothly in automatic high-speed or semi-automatic operations.

Whether you pack fertilizer . . . insecticides . . . or agricultural chemicals you want a bag that will keep moist products, moist and dry products, dry. There's only one way to be sure! Pack your product in Flav-O-Tainer bags.

Flav-O-Tainer bags are lined with Pliofilm*, the wonder film that lets carbon dioxide out, yet keeps potency-robbing oxygen from getting in. The inner seams are hermetically-sealed too, and after the bag is filled, it can be heat-sealed, film to film.

Flav-O-Tainer bags keep non-edible, hydroscopic materials fresher, longer. And they're easy and economical to fill. Add to this the smart, colorful printing of the Flav-O-Tainer bag and you have a good idea why they are so popular. Be sure to ask about Continental's Tailor-Made Package Service, too. Packers find it a great help.



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Deere Nitrogen Plant in Okla.

Officials of Deere & Company and its new Grand River Chemical Division are on deck as some of the first tank cars of anhydrous ammonia are filled.

Observing the new operations are from right to left: W. W. Yeandle, works manager, Chemical Division; W. A. Hewitt, executive vice president, L. A. Rowland, vice president, and general manager, chemical division; M. A. Fraher, vice president, John R. Taylor, Jr., sales manager, Chemical Division; P. R. Soule, Jr., assistant sales manager, Chemical Division; C. L. Oheim, vice president; and R. B. Adv, chief engineer, Chemical Division.

The Pryor, Oklahoma plant, with a rated daily capacity of 180 tons of amomnia, came on stream during the latter part of August. Most of the plant's ammonia will go into the production of urea . . . . the remainder going into industrial and fertilizer manufacturing and for direct application.

Utter to Painesville, O.

Dr. Gordon Utter, manager of technical service at the Newark, N.J., plant of Diamond Alkali Co., was transferred October 15 to the Painesville, Ohio, office of Diamond. Dr. Utter has been with Diamond Alkali Co. since February, 1953.

•

Korea Allotted Fertilizer

Korea was allotted $14,500,000 last month by the FOA for the purchase of fertilizers. The purchasing will be handled by the Korean government, and the opening date of the bidding will be announced shortly. The FOA announcement stated that the contract period will extend until December 31, with deliveries to be made by April 30, 1955. Source of the fertilizers is to be the United States and possessions, Canada, Latin America, Japan and European participating countries.

Monsanto Names Cornwell

Appointment of Franklin J. Cornwell of St. Louis as director of advertising and sales promotion for Monsanto Chemical Company's Merchandising Division was announced last month. Cornwell replaces Michael H. Sloman, who recently resigned from the company. Edward L. Hodge of San Francisco was named general manager of sales for the division.

•

Union Bag Names Recher



Union Bag & Paper Corp. last month announced the appointment of Harry M. Recher as director of flexible packaging sales. A member of the Union organization since 1945, Mr. Recher served most recently as director of honeycomb sales.

Clemson Fertilizer Conference

Fertilizer manufacturers, dealers, and technical representatives were to attend the annual South Carolina Fertilizer Conference at Clemson College, November 3-4. Dr. H. J. Webb, chief chemist, Clemson Department Fertilizer Inspection and Analysis, presided at the opening session, and opening remarks were made by Dr. M. D. Farrar, Clemson dean of agriculture.

Among the speakers and the subjects discussed at the session were to be J. N. Davis, Leesville, S. C., discussing "Improving Our Fertility Program;" H. G. Albritten was to report on "Soil Testing in South Carolina;" other reports and speakers were as follows: E. R. Collins, Raleigh, N. C., "Nitrogen (Solid, Liquid, and Gas) for Direct Application"; J. Fielding Reed, Atlanta, Ga., "More Efficient Use of Fertilizers"; W. A. King, "Pasture Grazing Results"; and R. W. Carter, "Livestock Sanitary Work."

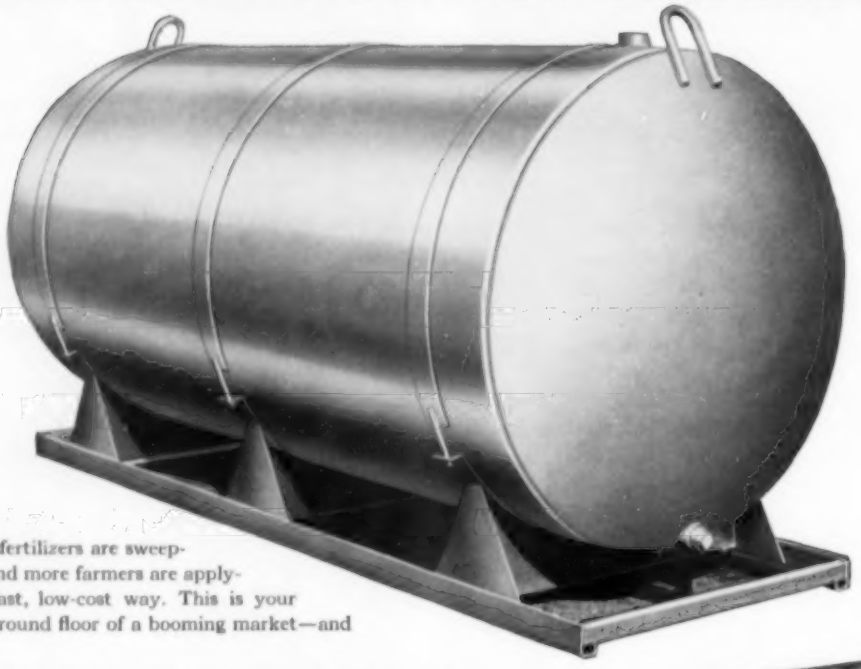
A feature at the Nov. 3 session was to be a tour of the college campus and of the Experiment Station pastures.

Dr. Ivan E. Miles, leader, Extension Agronomy, Mississippi State College, was scheduled to address the annual banquet at the Clemson House on Wednesday night, his subject being "Whither Bound." He was to be introduced by D. W. Watkins, director, Clemson Extension Service. B.D. Cloaninger, head, Clemson Department of Fertilizer Inspection and Analysis, was to act as toastmaster.

Dr. O. B. Garrison, director, South Carolina Agricultural Experiment Station, was to preside at the November 4th morning session. Speakers and their subjects were: N. R. Page, "Crop Response to Boron and Manganese;" J. F. Bullock, "Research with Tobacco Fertilizer"; J. M. Lewis, "Tobacco Fertilizer Recommendations for 1955"; J. B. Pitner, "General Crop Fertilizer Recommendations"; J. H. Cochran, "Fertilizer Pesticide Mixtures;" J. E. Youngblood, "South Carolina Marketing Facilities and Services;" Henry

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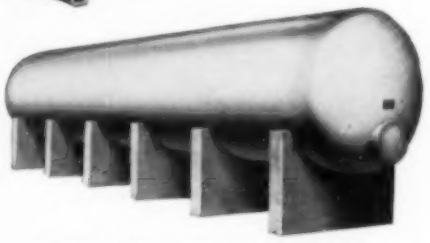
Welded low-pressure skid tank for on-farm storage. Available in 500, 830 and 1000-gallon capacities. Others (without skids) from 100 to 1000 gallons.

Liquid nitrogen solution fertilizers are sweeping the country! More and more farmers are applying nitrogen this new, fast, low-cost way. This is your chance to get in on the ground floor of a booming market—and profit as demand soars!

Butler now offers two types of special alloy non-corrosive aluminum bulk storage tanks for nitrogen solutions: (1) Bolted vertical 22,000-gallon tanks for non-pressure solutions; (2) Welded horizontal 12,000 and 22,000-gallon bulk storage tanks for low-pressure solutions.

Smaller size horizontal aluminum tanks in 100, 270, 500, 830 and 1000-gallon capacities are also available. The 500, 830 and 1000-gallon tanks can be factory-equipped with skids for on-farm storage or transporting solutions from bulk station to farm.

Act now and cash in! Send coupon today for full information.



Welded low-pressure tank for bulk storage. Available in 12,000 and 22,000-gallon capacities.



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S. Johnson, Columbia, "Financing the 1955 Crop"; and Mr. Cloaninger, "The New Fertilizer Law."

The Clemson House was headquarters for the conference.

•

Jefferson to Build

Jefferson Lake Sulphur Co., New Orleans, plans to go into the chemical fertilizer business, according to a recent announcement by E. H. Walet, Jr., president of the company. A triple super-phosphate plant in southeastern Idaho, having a capacity of 80,000 tons annually, is scheduled to be in operation late next year.

•

New Ketona NH_3 Plant

Ketona Chemical Corp., jointly owned by Alabama By-Products Corp., of Birmingham and Hercules Powder Co., Wilmington, announced last month that a contract for the engineering and construction of its projected anhydrous ammonia plant (within battery limits) has been awarded to the Fluor Corp. Ltd., of Los Angeles. The plant will be located at Ketona, Alabama. It will have an annual capacity of 45,000 tons of anhydrous ammonia. Scheduled to be in operation late in 1955, the plant is unique in that it will be the first American ammonia plant to be based entirely on coke oven gas.

•

Rupp Joins Hammond

Kenneth F. Rupp has joined the sales organization of the Hammond Bag and Paper Co. and will represent the company in southern Indiana and Kentucky. Mr. Rupp was formerly assistant sales manager for Raymond Bag Co., Middletown, Ohio.

•

Poisons Dictionary Planned

A medical directory of trademarks and generally known products which might be involved in accidental poisoning in the home is in preparation by a team of University of Rochester medical researchers. The book will list products; their hazardous ingredients, if any; the degree of damage to be expected from swallowing them accidentally, and what to do about it. The book will be published within the next year.

Union Bag Names Doyle



Union Bag & Paper Corp., New York, announced the appointment of Leonard J. Doyle to the position of vice-president in charge of research. Directing this new department, Mr. Doyle will consolidate all of the company's market research, product development and packaging machinery research activities.

•

Hansberry Speaks In Utah

It takes a million and a quarter dollars to develop an insecticide. But crop responses to favorable soil structure, microbiological balances, soil nutrients and their availability, and soil pest control, can be tremendous for the farmer.

So said Roy Hansberry, manager Modesto Laboratory, Shell Development Co., Modesto, Calif., in speaking to the National Association of County Agricultural Agents in Salt Lake City, Oct. 13.

"We have had responses to some soil applications that lead us to wonder if we ever see completely healthy, uninhibited plant growth under normal agricultural practice," said Mr. Hansberry.

He said there are a thousand places where soil chemicals will increase yield, reduce labor, or save a crop.

Dr. Cecil W. Creel of the Foreign Operations Administration, Washington, D.C., told agents of overseas employment opportunities as technical assistants in agriculture.

•

McGovran in Washington

The August, 1954 issue of *Agricultural Chemicals* carried a report by E. R. McGovran, on "Insect Research at State Experiment Stations." We incorrectly advised that Mr. McGovran is located in Berkeley, Calif. The correct address is USDA, Agricultural Research Service, Office of Experiment Stations, Washington, D. C.

Texas Fertilizer Market

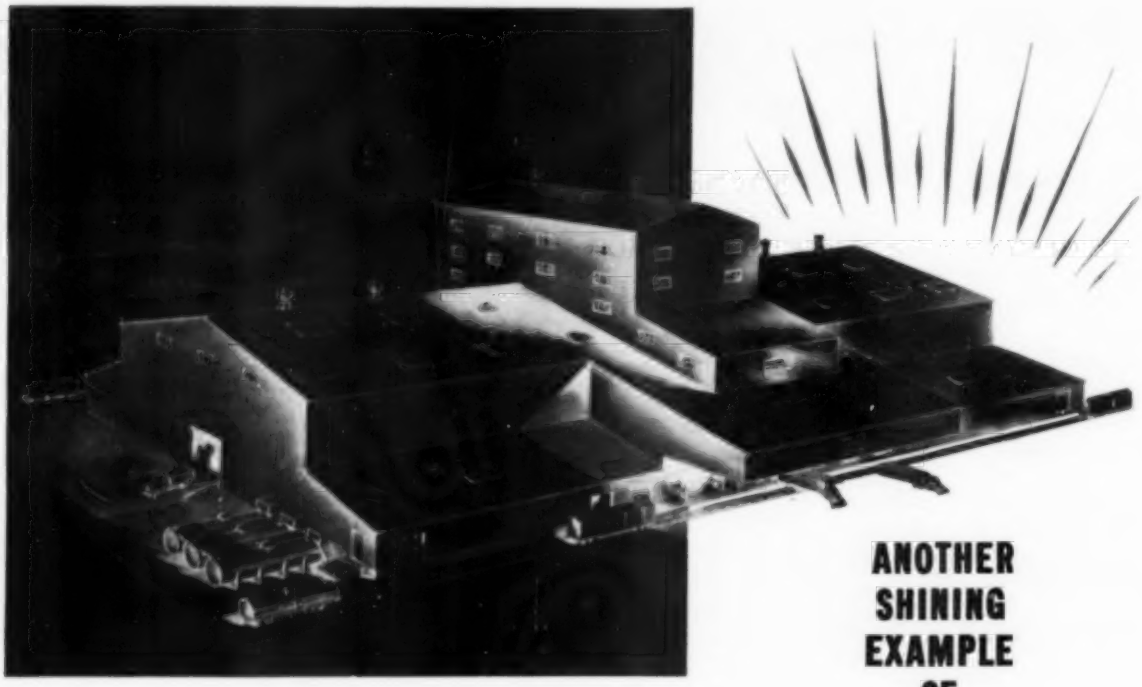
Marketing tips for fertilizer manufacturers who distribute their products in Texas are reviewed in the latest report of analyses of commercial fertilizers sold in that state during 1952-53. The report was issued in compliance with the Texas fertilizer law requiring the state chemist to analyze official samples of fertilizer to ascertain their compliance with guarantees.

Examination of data accumulated, the report states, indicates a continuance and acceleration of two trends which have been evident for several years. One is the use of mixed goods of higher analysis, the other a narrowing of the ratio between nitrogen and available phosphoric acid in both mixed goods and materials.

In studying figures on distribution of the principal grades by months the report shows that more than half of the 0-2-1 grades, principally the 0-14-7 grade, and of the phosphates, were sold during September, October and November. On the other hand, about three-fourth of the principal mixed grades and half of the ammonium materials were sold during the four-month period from January through April.

Further breakdown of the figures shows that the sales in the fall account for 25 per cent of the nitrogen, 43 per cent of the available phosphoric acid and 26 per cent of the potash sold during the entire year. Stated in another way, the report says sales of nitrogen and potash were three times as great in the spring as in the fall, while sales of available phosphoric acid were fairly evenly distributed between the two periods.

Mixed goods comprised 28 per cent of the nitrogen, 47 per cent of the available phosphoric acid and 96 per cent of the potash. Average over-all composition showed significant increase in nitrogen and potash and a slight decrease in available phosphoric acid sold. The report, covering the period from Sept. 1, 1952, through Aug. 31, 1953, shows that 570,506 tons of fertilizers and fertilizer materials were sold in Texas during that time. This was a 7 per cent increase over the previous period's tonnage.



ANNOUNCEMENT

Here is a brand new kind of fertilizer plant . . . the kind of plant Superintendents have been dreaming of. It produces granular mixed goods. It produces conventional mixed goods. It contains a host of new features that make it a real pleasure . . . and a real profit . . . to operate. Do you want us to tell you more about it?

ANOTHER SHINING EXAMPLE OF SACKETT "TUNED TO THE TRENDS" ENGINEERING SPEEDS PRODUCTION OF GRANULAR MIXED GOODS

Superphosphate and mixed goods producers are invited to get our seasoned counsel on their expansion and modernization programs. It is available at no cost.

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Architects and Manufacturing Engineers to the Fertilizer Industry since 1897

Canadian Association Meets in Montebello

AGRICULTURAL questions of current interest, concerning control of plant diseases, use of the newer agricultural chemicals, and the development and future of chemicals highlighted the program for the second annual meeting of the Canadian Agricultural Chemicals Association, which was held October 28-29th, at the Seigniory Club, Montebello, Province of Quebec. The central theme of the two-day session was "The Importance of Agricultural Chemicals in Our National Economy."

A panel discussion of the "Chemical Control of Plant Diseases in Canada" was led by chairman Dr. A. J. Skolko, Botany and Plant Pathology Division, Canada Department of Agriculture, Ottawa. Specific phases of plant disease were considered by the following members of the panel: L. C. Callbeck, Science Service Lab., Charlottetown, P.E.I., who discussed "Potato Diseases"; G. C. Chamberlain, Plant Pathology Lab., St. Catharines, Ont., "Fruit Crop Diseases"; L. W. Koch, Science Service Lab., Harrow, Ont., "Vegetable and Special Field Crop Diseases"; M. W. Cormack, Science Service Lab., Lethbridge, Alta., "Cereal and Forage Crop Diseases"; and R. A. Ludwig, Science Service Lab., London, Ont., who reviewed "Fundamental Aspects and Future Trends."

Information on some of the newer agricultural chemicals, such as malathion, maleic hydrazide, and methyl systox was presented respectively by: F. E. Barron, American Cyanamid Co., H. Douglas Tate, U.S. Rubber Co.; and R. C. Scott, Chemagro, Corp.

The second day of the two-day session included two more group discussions. Robert Glen, of the Canadian Entomology Division, acted as moderator, in considering some results from the Canadian Department of Agriculture's research program on pest control. Contributing to the overall review were W. A. Ross of the fruit insect unit; A. J. Skolko, of the botany and plant pathology division; and P. O. Ripley, of the field husbandry division.

A report on "Gains to the Farmer Through Proper Use of Agricultural Chemicals" was the theme of the final panel discussion. Contributors to this review included: J. Farquharson, Canadian Seed Growers Assoc., Ottawa; D. Kimball, Wyndham Orchards, Simcoe, Ont., and H. C. Greenlaw, Millville, N.B.

Charles C. Pettet, president of the Institute of Canadian Trade Association Executives, as luncheon guest speaker, addressed the meeting on the subject of "Developments of Agricultural Chemicals." The final session considered the various media of information in "Bringing the Message to the Farmer," including the press, television, radio, and govern-

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Weslaco, Texas • Apopka, Florida • N. Portland, Oregon

ment information bureaus. Arthur H. Carter outlined the role of industry in reaching and educating the farmer.

•

Manual on Fertilizer

By Vincent Sauchelli, Published by Davison Chemical Co., Div. W. R. Grace & Co., Baltimore.

This new, up-to-date edition of this well-known book reviews in simple, everyday language the processes of manufacture of normal and triple superphosphates and of complete mixed fertilizers. Gives practical examples of how to formulate mixed fertilizers.

It contains many new sections reflecting the newer technology of modern fertilizer plants . . . discusses chemical control, plant safety, and the efficient organization of the labor force in the plant. The book contains 80 tables of practical information, statistical information on the fertilizer industry, and coverage of ammoniation and granulation.



Oldbury Electro-Chemical Co. officially opened its new Columbus, Mississippi, plant on October 26 for the production of sodium chlorate. Under construction for two years at a cost of almost four million dollars, this plant will supply chemicals for agriculture and industry in the South and Southwest. Although manufacture is confined to sodium chlorate a present, facilities for manufacture of phosphorus pentasulphide are underway.

Trade Rules for Soil Conditioners Issued

TRADE practice rules for the Chemical Soil Conditioner Industry were published by the Federal Trade Commission on October 15, under the trade practice conference procedure. Such rules become operative 30 days from the date of publication.

The rules are directed to the maintenance of free and fair competition in the industry and to the elimination and prevention of unfair methods of competition. Production and marketing of commercial products, having as their active ingredients materials falling within the following groups, are subject to these rules: polyelectrolytes such as polyvinyls and polyacrylics, cellulose derivatives, and lignin derivatives, which are represented as having a primary function of stabilizing aggregates in soil to which they have been applied.

The first rule in this series protests "misrepresentation and deception in sale of industry products" and states that it is an unfair trade practice to represent or imply that the product:

"(1) Will effect a beneficial crops response in each and every type and kind of soil;

(2) Is a substitute, in any significant degree, for nutrient material;

(3) Is a complete substitute for added natural organic matter, except in its potential to form and/or stabilize soil aggregates;

(4) Will effect an appreciable modification of the texture, (i.e. sand-silt-clay ration) of any soil; and

(5) Will permanently exert a conditioning effect upon a treated soil."

Rule 1 also states it an unfair trade practice in the sale, or distribution of industry products to represent or imply that a particular quantity of the material will effectively treat any specified area of soil, without clear disclosure as to the depth to which such area will be effectively benefited. The rule specifies also that it is necessary to define soil preparation (if any) and the percentage of each fertilizing compound.

The following subjects are discussed in the remaining eleven rules by the commission:

Guarantees, warranties, etc.; Fictitious price lists; Substitution of products; Defamation of competitors or false disparage-

(Continued on Page 114)

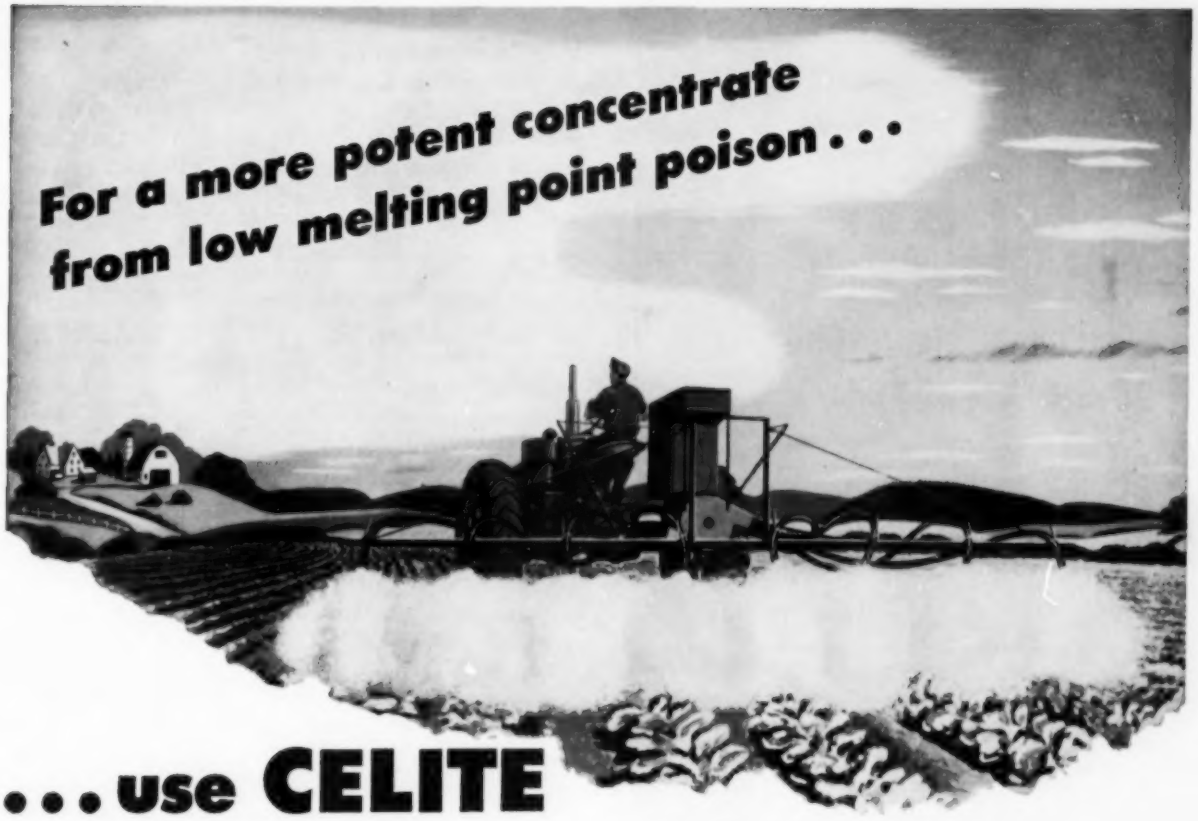
NFA Information Plan

The National Fertilizer Association, in its program of clarifying and explaining fertilizer use and cost, has recently prepared an envelope stuffer for use in replying to the question, "When are you folks going to get the price of fertilizer down within reach?" The stuffer (illustrated below) is for use by dealers on statements to their farmer-customers. It points out that fertilizer prices in terms of plant food content have increased only 13% since 1935, as compared with a 125% increase on most other items in the period.

The NFA has also published for the state of Ohio a new leaflet which illustrates graphically how farmers can increase profits on corn, hay, oats and wheat by using recommended amounts of fertilizer.



NFA promotional stickers available in lots of 500 at $3.50 per 1000, through the National Fertilizer Association, 616 Investment Bldg., Wash., D. C.



. . . use CELITE

One way to be sure of producing a dry dust concentrate that will give top performance in the field is to use Celite in your primary grinds.

The presence of only a small percentage of this diatomite powder—because of its great bulk per unit weight, and the irregular shape of the individual particles—fluffs up the final dust. This helps neutralize the effect of heavy extenders—insuring better dispersion of the poison.

Celite is also an excellent absorption medium for liquid poisons. Its exceptionally high absorption capacity permits a much higher percentage of liquid poison to be absorbed while still maintaining a dry dust concentrate. This results in a more potent effect in the final product . . . as well as in lower packaging and shipping costs.

Why not investigate the use of Celite as a means of improving your product and making your operation more profitable? For further details, write Johns-Manville, Box 60, N. Y. 16, N. Y.

Properties of CELITE

FINENESS: Approximately 100% through 325 mesh
DENSITY (Vibrated): 11 pounds per cubic foot
BULK: Celite bulks much higher than most diluents
ABSORPTION: 200% of its weight of water
300% of its weight of kerosene
pH VALUE: Below 7.0
INERTNESS: Compatible with insecticide and fungicide poisons
SUSPENSION: Excellent in both air and water
COMPOSITION: Celite is amorphous diatomaceous silica (SiO_2)



Celite is Johns-Manville's registered trade mark for its diatomaceous silica products.

Johns-Manville CELITE

DILUENTS AND GRINDING AIDS

CALMONITE

AMMONIUM NITRATE LIMESTONE

20.5% NITROGEN

2 FERTILIZERS IN 1
Contains 10.25% quick-acting *nitrate* nitrogen.
Contains 10.25% longer-lasting *ammonia* nitrogen.

GREEN PELLETS READY TO USE
Sized for flow and ease of application in broadcasting, top dressing, side dressing, and irrigation. Nonacid-forming.

ECONOMICAL SOURCE OF N
At low cost, Calmonite furnishes Nitrogen in the 2 forms needed by all plants — for rapid, early vigorous growth and sustained development.

SUPPLIES CALCIUM, TOO
Contains 35% to 40% calcium carbonate, secondary plant-food essential to soil productivity and good crop yields.

NOW AVAILABLE, F.O.B.
Regular Atlantic and Gulf ports, in even-weight, 6-ply paper bags with 2 bituminous liners.

LOOK AT CALMONITE!
Write for a sample and for additional information today.

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PO_3 Consumption Up 10%

Phosphate rock sold or used by producers in the United States during 1953 was more than 10 per cent above the 1952 figure. 1953 use was 12,517,923 long tons as compared with 11,324,158 tons for 1952. A detailed breakdown of the domestic agricultural uses is given below:

Uses	Total United States	
	Long tons	Percent of total
1953		
Domestic:		
Agricultural:		
Ordinary superphosphate	5,044,182	41
Triplesuperphosphate	1,154,537	9
Nitraphosphate	2,820	(1)
Direct application to soil	1,026,326	8
Stock and poultry feed	161,084	1
Fertilizer filler	13,157)	
Other fertilizers[3]	56,216)	
		1
Total agricultural	7,458,322	60
Total industrial	2,998,272	24
Exports[2]	2,061,329	16
GRAND TOTAL	12,517,923	100

(1) Less than 0.5 percent.
[2] As reported to the Bureau of Mines by domestic producers.
[3] Includes phosphate rock used in calcium metaphosphate, fused tricalcium phosphate, Rhenania type phosphate, and other uses.

•

PanAm Sulfur in Production

Pan American Sulphur Co. announced last month that the firm has begun production at its properities in Veracruz, Mexico. Ten sulfur-producing wells were expected to be in operation by November 1st. The plant uses the Frasch process for sulfur recovery.

•

Davison Announces Appointments

Plants of the Mixed Fertilizer Division, Davison Chemical Co. Division of W. R. Grace & Co., were recently grouped into three districts, with managers reporting to W. N. Watmough, Jr., Davison vice president, at Baltimore headquarters. The following appointments were announced: B. C. Manker as central district manager at Lansing, Mich., John W. Ground, III, to be western district manager, with headquarters at Joplin, Mo., where he has been located. Joseph F. Stough, formerly general sales manager for International Minerals and Chemicals Corp., at Chicago, Ill., will join Davison November 1 as southeastern district manager with headquarters at Charleston, S. C.

George Klein, for a number of years district manager at Nashville, Tenn., is now general sales manager of the Mixed Fertilizer Division, with headquarters in Baltimore. W. P. Stansbury is advanced from operations manager to director of branch plant operations, Mixed Fertilizer Division. His headquarters will continue

at Baltimore. Joseph E. Reynolds, Jr., formerly at Joplin, Mo., is transferred to Batlimore as operations manager of the Division and E. L. Carnell, former superintendent of the Savannah plant, is transferred to Baltimore as production planning supervisor. John Detgen is assistant manager at Columbus, O., where M. C. Evans is manager, and E. S. Jackson, assistant manager at Nashville, is made manager at that plant.

A. C. McCall is appointed manager with responsibility for sales and operations at Joplin and Trenton, Mo., and Tulsa, Okla. U. S. Aaron is advanced from sales manager at Savannah, to manager, and Chandler Smith is advanced from manager at Ft. Pierce, Fla., to assistant manager in charge of sales for Charleston and Spartanburg, S. C., and Savannah, Ga. A. C. Gordy becomes branch plant manager at Ft. Pierce, Fla., and R. L. Johns is branch plant manager at Jacksonville, Fla.

•

Cotton Insect Control Conference Dec. 2-3

The eighth annual beltwide Cotton Insect Control Conference will he held at the Adolphus Hotel in Dallas on December 2-3, according to the Council's production and marketing division.

Attending the event will be several hundred leaders in farm research and education, manufacturers and distributors of insecticides and equipment, commercial applicators, and farm and trade groups. The complete conference program will be announced soon.

Immediately preceding the Council-sponsored event will be a two-day companion conference limited exclusively to state extension entomologists and their associates, to personnel of the U. S. Department of Agriculture, and a few others.

•

CFA Convention in Coronado, Calif.

An attendance of about 400 is expected at the 31st annual meeting of the California Fertilizer Association, which will be held November 15-16 at the Del Coronado Hotel, Coronado, Calif., according to the announcement by B. H. Jones of Fresno, president of the association. Among the speakers who will review the commercial fertilizer picture will be Paul Truitt, president of the American Plant Food Council; W. R. Allstetter, vice president of the National Fertilizer Association; and M. E. McCollam, Western States Manager, American Potash Institute.

Three directors will be elected at the business meeting to serve for the next three years.

•

TVA Reports Fertilizer Production

TVA reported on October 27th that at the close of the fiscal year 1954, which ended on June 30, it had total assets of $1,946,484, an increase during the year of $205,198,042. Fertilizer production for the year included 188,328 tons of ammonium nitrate, and 93,706 tons of P_2O_5 in concentrated superphosphate, calcium metaphosphate, and fused tricalcium phosphate . The entire fertilizer and munitions development program earned a net income $492,140.



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Let VELSICOL AR SOLVENTS help solve your solvent problems!

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Why Velsicol AR-Solvents Contribute To The Overall Efficiency And Performance Of Your Formulations

1. **Chemical compatibility with herbicides and both synthetic and botanical insecticides.**
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5. **The solvents are non-corrosive to metals.**
6. **The high boiling range of these solvents (low volatility) favors the residual toxicity of the more volatile insecticides.**

Velsicol AR-Solvents offer formulators extreme latitude in selecting a solvent for their particular application.

That's why the AR-Solvents are favored solvents for such insecticides as DDT, Lindane, Parathion, Heptachlor and BHC . . . and for such herbicides as Penta, chlorophenol and the esters of 2,4-D and 2,4,5-T.

Whether your formulations are intended for agricultural or household application, there's an AR-Solvent specific for your use.

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Chemicals for Agriculture in Spotlight at 8th National Chemical Exposition

By H. H. Slawson

THE 8th National Chemical Exposition, held in Chicago, Oct. 12 to 15, brought together every segment of the nation's vast chemical industry for effective presentation of the role of chemistry in everyday living. Assembled in the huge, historic Coliseum, some 200 exhibitors displayed basic raw materials, processing and laboratory equipment, accessories and supplies, to an estimated 15,000 visitors.

Sponsor of the show was the Chicago section of the American Chemical Society, together with the Chemical Market Research Association, the Manufacturing Chemists Association and others, who conducted the technical symposia staged during the show's run. Noteworthy contributions to furtherance of the exposition's aims were made, also, by the Purchasing Agents Association of Chicago, the Chicago Retail Merchants Association, the Armed Forces Chemical Association, Midwest chapter, and various high schools and colleges in Chicago, and northern Illinois and northern Indiana.

Highlight of the many associated meetings was the chemical industry medal dinner of the American section of the Society of Chemical Industry, at which Ernest H. Volwiler, president of Abbott Laboratories, and chairman of the board of the American Chemical Society, received the Society's annual award "for conspicuous services to applied chemistry."

Chemicals for agriculture were numerously included in the array of products shown by different exhibitors, but the outstanding presentation of chemicals for every day use on the farm was found in a special educational exhibit of petrochemicals provided by the petroleum industry. Created originally for showing at the International Petroleum Exposition in Tulsa, Okla., this exhibit was later donated to the National Oil Museum, which loaned it to the Chicago exposition.

In one section of this lengthy exhibit, the story of the American farmer's dependence on chemicals from petroleum is illustrated. Included are fertilizers for the corn field, insecticides for the orchard, garden, lawn and fields, weed killers for irrigation ditches, brush killers for the pasture, cattle dipping vats and spray tents, aerial dusting planes complete with "cloud" of chemicals, soil conditioners, fumigants, defoliants, etc.

Prominent also in this exhibit was the "Growing Tree of Petrochemicals," a diagrammatic design, springing from oil at its base and having, to date, fourteen branches, including agricultural chemicals.

In another educational exhibit of "Chemical Trail Blazers," which presented new ideas, new materials, and devices was a 3 x 4' wall panel, which related the beginning of work by the Tennessee Valley Authority, to make use of low grade ores from the Florida phosphate mines as a source of phosphate for fertilizer. This was the first public showing of this new process.

The TVA project proposes to make use of the millions of tons of "leached zone" low grade ore overlaying high grade ore in the mines, which has to be removed to reach the high grade rock.

At Wilson Dam, Alabama, pilot plant work is being carried on to develop a practical and economic method to recover the wasted phosphate and the uranium. Pictures and diagrams in the panel display explained the process which is being studied by T. P. Hignett, M. R. Siegel, T. M. Kelse and R. S. Meline of the TVA staff.

Among fertilizer grades made at this pilot plant, 15-15-15, 20-20-20 and 11-22-11 are mentioned. The products are said to be well granulated, do not cake in storage, and flow readily in fertilizer application equipment. Agronomic tests are now under way at state experiment stations.

Visits to the booths of many exhibitors revealed how manufacturers, in their efforts to serve the agricultural chemical fields, have on hand many new products, new methods, new equipment, reflecting latest developments in chemical science.

Versenes, Inc., Framingham, Mass., featured iron chelating concentrates, including Versen-O L, for addition to alkaline soils, to correct lime-induced chlorosis. Colored slides told the story of what this treatment has accomplished.

National Aniline div., Allied Chemical & Dye Corp., New York, presented their line of improved Nacconal compounds, including Nacconal DB, for use, at 1 lb. to a ton, for conditioning fertilizer. Other improved compounds were shown for use in washing vegetables and fruits in canning and quick freeze plants, removing insecticide residues on apples, etc. Featured, too, was a new "Nadic" anhydride compound for use in formulating repellents for control of fleas, mosquitoes, ticks, black flies, chiggers and other pests.

Davison Chemical Corp., Baltimore, Md., reserved a corner of their exhibit space for reminder listing of their line of granulated and mixed fertilizer, including triple superphosphate, made in their year-old plant at Ridgewood, Fla. Principal attention was directed to a new thickening and blocking agent, Syloid 244, for varied industrial application. D. P. Barrett, sales manager, in charge.

Saran Lined Pipe Co., affiliate of Dow Chemical Co., was represented by the Ken Groves Co., Chicago sales agent, whose spokesman, R. H. Krause, explained how corrosion is combatted in pipes, tubing, valves and fittings lined with the saran plastic substance. It effectively handles any acid in any concentration up to 195° F., he said.

V-C Inspections Mean Better Bags for You





Inspection of newly tubed bags just before bottoming operation. Careful inspections mean better bags for you.

Inspection of finished pasted bags. Because these pasted closures must stand great weight and shock, special care is taken to see that all surfaces are absolutely bonded.





Final inspection of sewn-valve bags. Specially-trained inspectors examine every bag before it moves to the baling machine.

EVERY STEP in the manufacture of V-C Multiwall Bags is controlled by a system of rigid inspections. Operators are specially trained to watch for the slightest imperfections. It will pay you to put V-C's bag-making experience and skill to work on your packaging problems. Write for full information about better-built V-C Multiwall Bags, or discuss your bag requirements with a V-C representative.

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Worthington Corp., Harrison, N. J., had a small working model of their fast action fertilizer mixer, which will handle batches from half a ton to 3 tons, on a 2-minute cycle, according to H. E. Gallison, manager, industrial mixer division. Also shown was a model of the new Worthington continuous ammoniator, which, as a result of TVA experiments, was developed for manufacturers of dry commercial fertilizer. Other company representatives handled the Worthington pump line and explained their custom-made pump building service for chemical processors.

Continental Can Co., featured a new fiber drum with polyethylene lining for liquids, which after two years of development work, is now in use by several companies. Also shown was Continental's "Leverpak" fiber drum line for bulk powdered products and other items from their fiber drum section.

Commercial Solvents Corp., New York, concentrated on a group of new chemical products chiefly for industrial applications, but not yet available on the market. They have been developed, according to L. L. Hallock, in charge of market development, at a pilot plant in Peoria, Ill., and will be placed on the market, some time next summer, when large scale production begins in a plant, now under construction at Sterlington, La.

Combustion Engineering, Inc., Raymond div., Chicago, displayed and demonstrated their line of pulverizing and separating mills, including a new 8-inch vertical mill for fine grinding. Latest installation of Raymond equipment, according to H. J. Hibner, was made in a new insecticide manufacturing plant opened early in October at Managua, Nicaragua, with that country's president participating in the dedication ceremonies.

First of its kind in all Central America, the new plant is operated by Thos. Wheelock, Ltd., an affiliate of Diamond Alkali. In a country where annual rainfall measures up to 250 inches, insecticides have not been considered of much practical use. Mr. Hibner told of one cotton field with a 92 per cent infestation of "just about every bug in the country." Participation of Nicaragua's president in dedication of the new plant, said Mr. Hibner, is indicative of the hope that the new plant will be a start at correcting the prevailing agricultural pest conditions.

National Carbon Co., div. of Union Carbide & Carbon Corp., explained the recently organized service for furnishing standardized heat exchangers, pipes, pumps and fittings treated with corrosion-resisting "Karbate."

Frank G. Hough Co., Libertyville, Ill., had in their booth two of their versatile "Payloader" tractor shovels for handling bulk chemicals and fertilizers. Demonstrations were directed by James Suter, sales engineer, and Jack Peaco, assistant to the advertising manager, who also called attention to the attachments available for performing other jobs around an industrial plant.

Zonolite Co., Terralite div., Chicago, had a display of the innumerable applications of their vermiculite mineral with stress on its use as a fertilizer conditioner and as a carrier for insecticides, chelating compounds and other chemicals. Phil Strand, advertising manager, directed the presentation.★★



NEVSOLV 200

Boiling Range	195°C (383°F) to 200°C (536°F)
Specific Gravity	.890 to .915
Color	Straw

NEVSOLV 30

Boiling Range	130°C (266°F) to 190°C (374°F)
Specific Gravity	.835 to .845
Color	Water White

These NEVSOLVS are active solvents for DDT, BHC, 2-4-D esters, etc., and are especially clean with good odor.

Neville's new NEVSOLV series is ideally adapted to the insecticide and herbicide solvent field.

These two popular grades have individual characteristics, but other boiling ranges are available to meet your requirements.

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AC-1

Paper Canisters KEEP THEIR POWDER DRY!



Paper gun shoots to kill garden bugs! This novel Harcord package helps boost Pratt's Garden and Rose Dust sales to an all-time high! Harcord's simple yet effective powder spray gun works easily, conveniently, because Harcord standards turn out only action-perfect packages. And Harcord's budget-wise pricing permits a fast "retail" on a sell-on-sight-package.



AMMUNITION for insect control is one of the many areas where Harcord packaging plays a big and budget-conscious job . . . because these adaptable paper canisters are so well suited to the insecticide field. Special "moisture-proof" processing helps maintain the free-flowing high potency of many powdered insect killers. Let Harcord engineering "know-how" produce the canister that will suit the precise purpose of your product . . . well within your budget!



Vivid TAT MO-GO container lures customers with its eye-catching package . . . and snug, easy-action plug closure. This competitively priced Harcord canister puts self-service appeal into a top-performing insecticide.



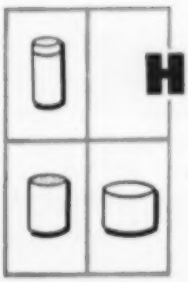
Familiar sight on farms and orchards is this ORCHARD® Brand Genitox® S-50 container. This outstanding DDT spray powder is packaged by Harcord for General Chemical in a rugged paper canister which provides sturdy, long-lasting protection.

**Reg. U. S. Pat. Off.*

You Sell It Better . . .

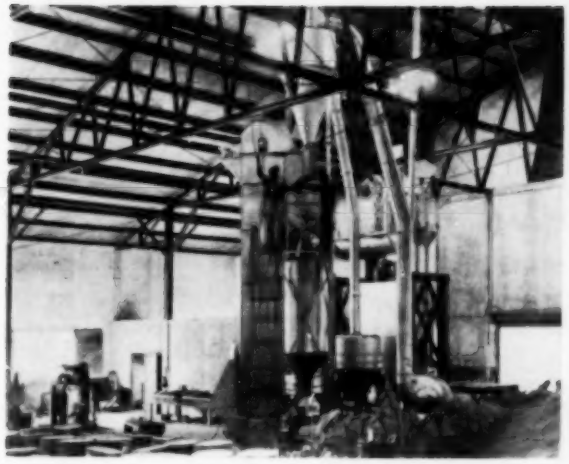
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Some of the machinery installed by Diamond Alkali for the new plant of Industrias Quimico - Agricolas of Managua, Nicaragua. This new insecticide formulating plant will provide Nicaragua with more than half of its insecticide needs.

C. America Insecticide Plant

The largest insecticide formulating plant in Central America went into production on October 1st. Engineered by Diamond Alkali Inter-American Corp. for Industries Quimico-Agricolas, this plant will be able to produce more than 1,000,000 pounds per month of finished insecticides working on an 8 hour per day basis. The plant is located in Managua, Nicaragua.

•

Southern Weed Meeting Jan 17

Plans are moving ahead rapidly for one of the largest conferences on weed control ever held in the South, it was announced last month by Dr. Warren C. Shaw, president of the Southern Weed Conference. Sessions of the eighth annual meeting will be held at Hotel Soreno in St. Petersburg, Fla., January 17 through 19.

High on the agenda will be weed control in field crops, weed control in cotton, agricultural engineering problems in weed and brush control, extension aspects of weed control, physiological problems in herbicidal investigations, control of woody plants, and weed control in horticultural crops and special weed problems.

Barrett L. Collier, program committee chairman, said that a complete program would be released at a later date. Attending will be representatives from state experiment stations, USDA, extension services, the agricultural chemicals and farm equipment industries, vocational agriculture and the farming industry. Dr. E. G. Rodgers is chairman of the local arrangements committee.

•

New IMCC Laboratory

A new analytical control laboratory was opened recently at East Point, Ga., by International Minerals & Chemical Corp. The laboratory runs analyses for nitrogen, phosphoric acid, and potash in various grades manufactured by each of International's 26 plant food plants located in as many states across the country. Its principal function is to guarantee quality control. Its capacity is approximately 100,000 determinations a year.

•

Korea Fertilizer Awarded

The General Services Administration has announced two awards for fertilizer which the agency purchased for shipment to Korea under the FOA program. The accepted bids were: U. S. Phosphoric Products, division of Tennessee Corp., 690 metric tons of P_2O_5, 46 per cent granular at $140.10 per ton; and Commodity Credit Corp., USDA, 5,950 metric tons of triple superphosphate, containing a minimum of 45 per cent of available P_2O_5, powdered at $63.85 per ton. The CCC award was the equivalent of 2,677 tons of P_2O_5, and the two lots totaled 3,627 of the 4,000 tons for which the GSA advertised in September. The agency reported that the entire amount was not acquired, because of fund limitations.

United Co-Op Chemical Moves

United Co-operative's Philadelphia office, located for the past eight years at the Fidelity-Philadelphia Trust Building last month moved to 450 W. Ely Street, Alliance, Ohio. Farm chemical operations of the company include the processing of insecticides, fungicides, oil base sprays, weed and brush killers and miscellaneous products.

•

Bear to Renner Post

Dr. Firman E. Bear has been named research consultant to the Hobiltzelle Agricultural Laboratory of the Texas Research Foundation, Renner, Texas. Dr. Bear will continue as editor in chief of the magazine "Soil Science".

He will assist scientists at the foundation in reviewing the agricultural program at Renner; and will also travel throughout the United States and in South America studying problems of agriculture.

•

Potash Institute Appoints

The American Potash Institute announced last month the appointment of Dr. Werner L. Nelson to work with Dr. G. N. Hoffer, midwest territorial manager. Along with the investigations of fertilizer and lime requirements, Dr. Nelson has studied fertilizer placement, rotation effects, and plant and row spacing. In 1949 he became director of the soil testing division of the North Carolina Department of Agriculture. Since 1951 he has been in charge of soil fertility research. Dr. Nelson is program chairman of Division IV "Soil fertility, fertilizer, and plant nutrition" of the Soil Science of America.

•

Gallowhur Names Geraci

John Geraci formerly plant manager of Gallowhur Chemical Corp., New York, has been appointed vice president in charge of production and development. He was formerly associated with Calco Chemical Co. as a research and development chemist and the Sterone Corporation as an assistant technical director before coming to Gallowhur in 1952.

Better than ever

ORTHO LINDANE more than meets government standards

ORTHO Lindane 100 is actually purer than the minimum government standards – has a minimum gamma isomer of 100% . . . highest potency . . . combines effectiveness with economy.

Easy to formulate

ORTHO Lindane is easy to handle and formulate as a spray or dust. The crystals are dry and free-flowing, easily ground to micro-size.

ORTHO Lindane may be purchased in prepared formulations under the ORTHO brand name of ISOTOX. A variety of ISOTOX formulations in liquid, wettable and concentrate form is available.

Call your nearest ORTHO sales office for full details and free explanatory literature.

CALIFORNIA SPRAY-CHEMICAL Corp.

Portland, Ore.	Sacramento, Calif.	Orlando, Fla.	Linden, N.J.
Whittier, Calif.	Caldwell, Idaho	Phoenix, Ariz.	Medina, N.Y.
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World leader in scientific pest control

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SCIENTIFIC PEST CONTROL

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On all chemicals, read directions and cautions before use.

Elm Diseases Threatens Chicago

Tree care specialists in Chicago and Cook County, Ill., are organizing to combat a threatened spread of the deadly Dutch elm disease to trees in that city's 166 parks and the Cook County Forest Preserves ringing the city. Up to Oct. 1 no known cases of Dutch elm disease have been found in the city parks; however, it has been found in suburban areas close to the city, notably in Highland Park, Kankakee, Peotone, Joliet and Aurora, Ill., and in Milwaukee, Wis., all within striking distance of Chicago.

Dr. L. R. Tehon and Dr. J. C. Carter of the Natural History Survey advise that there is no known cure for the disease, but it can be curbed by removing and burning infected trees and by use of DDT against the European bark beetle, which is believed to be the carrier of the virus.

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FMC Opens N. Y. Export Office

Food Machinery and Chemical Corp. has established corporate export offices in New York to represent the company's export lines of industrial and agricultural chemicals and various machinery items.

The new office at 161 East 42nd street combines the export sales group of FMC's chemical divisions under the direction of Robert R. Clark, manager of chemical export sales, and a sales engineering staff representing various machinery divisions of the company.

•

CSMA Moves Offices

The Chemical Specialties Manufacturers Association has moved into new offices on the tenth floor of the Chemists' Building at 50 East 41st St., New York City. The new telephone number of the Association is MU 5-8722. H. W. Hamilton is Secretary.

•

Entomologist Patch Dies

Dr. Edith M. Patch, 78, internationally known entomologist, died September 28th at her home in Orono, Me. Dr. Patch came to the University of Maine when it founded its Department of Entomology at the Agricultural Experiment Station, and headed the department until her retirement.

•

Velsicol Names Mahl

Velsicol Corp., Chicago, recently advanced H. L. Mahl to the position of superintendent of its new insecticide department at the firm's Memphis, Tenn. plant. Mr. Mahl was engaged most recently in development projects and production at Velsicol's organic chemicals plant in Memphis.

Ark. Insecticide Plants

James Cranor has announced plans for removal of two insecticide plants—the Ar-Nu Company of Moro, Ark. and the Cranor Insecticide Co. of Forrest City, Ark. to Brinkley, Ark., where he has purchased an 11 1-2 acre tract of land and a former school building, which is being remodeled for manufacturing purposes. The plant will produce insecticides for retail outlets in Arkansas and adjoining states.

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NSC Division Report

The Fertilizer Section of the National Safety Council has recently issued its 1954 booklet on "Accident Rates," containing accident experience for 1953 for all companies that report to the NSC. The report shows that the Anniston, Ala. plant of Monsanto Chemical Co. had the best record for "no-injury" in the fertilizer industry. The company shows 2,503,857 injury-free manhours.

Another announcement of the Fertilizer Section commends the work of R. E. Bennett, Farm Fertilizers, Inc., Omaha, Neb., who has been active in getting all the Nebraska fertilizer plants to join the National Safety Council.

•

Miss. Co. Expands NH_3 Prod.

Three expansion projects, one completed and two underway, will increase the ammonia production capacity of the Mississippi Chemical Corp's plant in Yazoo City, Miss. from 120 tons to a total of 290 tons per day. The Girdler Co., Louisville, Ky., is designing and engineering the additional synthesis, gas generating and purification facilities.

•

Pacific Coast Advances Kitchen

The Pacific Coast Borax Co., Division of Borax Consolidated, Ltd., New York, announced last month that E. M. Kitchen has been transferred from the Plant Food Division to the Industrial Division, with headquarters in Los Angeles. Mr. Kitchen, graduate of New Mexico A & M, has been with the company since 1936.

•

Theodore Haschke Dies

Theodore A. Haschke, 56, director of sales of the Industrial Chemical Division of Stauffer Chemical Co., New York, died October 5th in New York Hospital. He was also a director of the Old Hickory Chemical Co., Old Hickory, Tenn.

Mr. Haschke joined Stauffer as a salesman in the Houston territory in 1926 and was transferred to New York six years later. He was named sales manager of Stauffer's Eastern Division in 1942, a post he held until his most recent assignment in January of this year.

•

CMRA to Chicago, Jan. 20

The Chemical Market Research Association plans to hold a joint meeting with the Commercial Chemical Development Association at the Edgewater Beach Hotel, Chicago, January 20-21, 1955. The theme under discussion will be "Chemicals in Food and Feeds."

Wyandotte Names Brunner



Horace C. Brunner has been named manager of the Chicago office of Wyandotte Chemicals Corp., Michigan Alkali Division. Mr. Brunner assumed his new duties on November 1st.

A Wyandotte employee since 1930, Mr. Brunner was manager of Wyandotte's Detroit office for six years. Befor being appointed assistant manager of the Chicago office, he served as manager of distributor sales at the company's home office in Wyandotte, Mich.

NEW!

FLINT NH3 FARM TANKS

Easier to Sell—
They're Easier to Use!

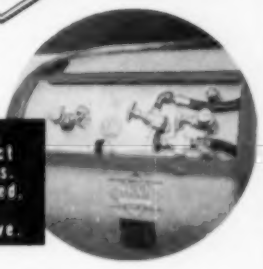
Two features make newly designed FLINT NH3 TANKS fast sellers. First, *FLINT Anhydrous Ammonia TANKS are easier to use.* Open and easy-to-reach fittings give positive pressure control and are protected from damage. Second, *your customer will have fewer stops for refilling.* For you, *FLINT NH3 TANKS bring no customer complaints, have no returns for improper functioning.* Each FLINT TANK is built of heavy steel plate, carefully welded to weather-proof. Checked by a National Board Inspector to meet safety regulation and code for 250# psi working pressures. Shipped dry and complete with NH3 pressure gauge.



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APPLICATOR TANKS		
100 gal.	157 gal.	200 gal.
235 gal.	310 gal.	500 gal.
FARM SERVICE TANKS		
500 gal.	1000 gal. in 28" - 41" and 46" diameter	
BULK STORAGE TANK		
6000 gal.	10,000 gal.	30,000 gal.



Open, compact fittings. Protected, non-corrosive.



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PESTMASTER* TECHNICAL GRADE DDT is preferred by manufacturers of quality insecticides because of properties that make it easy to work. The unusual hardness of Pestmaster* brand simplifies the grinding, and its uniform cleanliness contributes to ease of handling. Its quality is unexcelled.

MICHIGAN CHEMICAL TECHNICAL GRADE DDT is distributed in the United States and possessions by Wyandotte Chemicals Corporation, Wyandotte, Michigan, and may be ordered through them in any quantities, with the usual fast delivery enjoyed through Michigan Chemical Corporation.

PESTMASTER* 75% AND 50% DDT WETTABLE POWDER AND DUST CONCENTRATES. The wettable formulations have quick wetting properties, and are intimately and uniformly blended with the carrier. Their unusual quality is in their excellent suspension properties. They remain uniformly in suspension. The 75% Wettable powder is made to World Health Organization specifications, and *has been especially designed to withstand severe tropical conditions of use and storage.*

PESTMASTER* 25% DDT EMULSION. Here is a 25% emulsion with low phytotoxic qualities that reduces to a minimum the danger of burning foliage when used properly, and emulsifies in water of any degree of hardness. It emulsifies quickly and meets all quality standards.

Michigan Chemical Corporation also manufactures other chemicals used in agricultural products. Among them are:

Magnesium Carbonate	Methyl Bromide
Magnesium Oxide	Soil Fumigant

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QUALITY PRODUCER OF PESTMASTER* DDT AND METHYL BROMIDE AND OTHER AGRICULTURAL CHEMICALS

Sharp Joins Prentiss



Robert D. Sharp, formerly southwestern sales manager for John Powell & Co., has joined Prentiss Drug & Chemical Co., as assistant to John R. Stoddard, vice-president in charge of sales of insecticides and other agricultural chemicals. His headquarters will be in the New York office of Prentiss.

Mr. Sharp received a B.S. Degree in entomology from Purdue University in 1950 and immediately joined Powell's technical service department. He was named head of the company's entomological section in 1951, was appointed northeastern sales manager in 1952, and was transferred to the southwest the following year.

•

British Weed Conf.

The British Weed Control Council was scheduled to hold a meeting in Harrogate, England on November 2-4th. Among the subjects to be discussed at the meeting were: "The Present Position of Herbicides in British Agriculture," "Rotation of Weed Killers", "Legal Aspects of Spray Damage" and "Weed Persistence and Dispersal".

•

Smith Douglass Reports Gain

Sales and profits of Smith-Douglass Co., Inc., Norfolk, Va., manufacturer of chemical fertilizers, were at record levels in the fiscal year ending July 31st. Net income amounted to $2,457,099 or $2.51 a common share, which was an increase of 12.9 per cent over the previous year. Net sales increased 6.3 per cent.

•

Sun Ammonia Plant

Sun Oil Co. plans construction of a $9 million anhydrous ammonia plant at its Marcus Hook, Pa. refinery. The new plant to be completed late next year will have a capacity of 300 tons a day.

•

Am. Potash Advances Mazza

Harold Mazza, research process engineer for American Potash & Chemical Corp. at its main plant at Trona, Calif., has been appointed assistant director of research for the company. Mr. Mazza, who started with American Potash & Chemical Corporation in 1929 as a sampler in the control Laboratory, will direct the new products division at the Trona research laboratory.

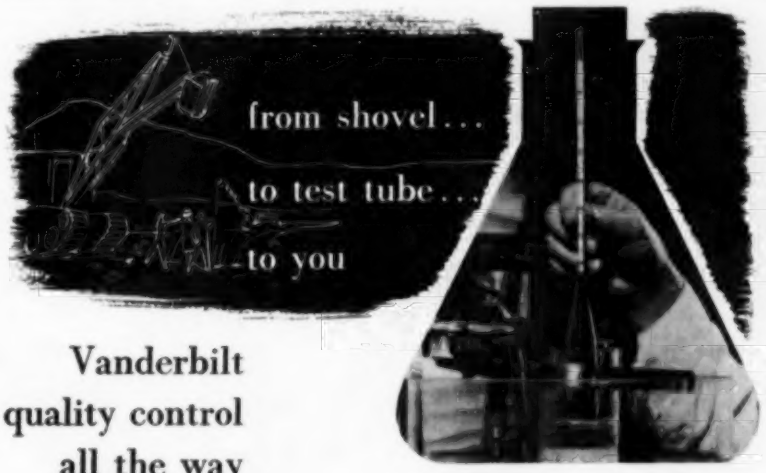
•

Wilbur Ellis Names Allard

The Wilbur-Ellis Co., Seattle, Washington, announced last month the appointment of Robert Allard as manager of the agricultural chemical department. Mr. Allard was formerly with the Fresno Agricultural Chemical Co., as manager of the insecticide department.

Bradley & Baker Names Horne

The transfer of Everett C. Horne from Indianapolis to their New York office was announced by Bradley & Baker, fertilizer sales organization. Mr. Horne, who formerly was a sales representative in the Indianapolis office, will assume the position of general sales manager of the Fertilizer Division at the Bradley & Baker head office. Replacing Mr. Horne in Indianapolis will be Edwin T. Baker, with offices in the Board of Trade Building.



Vanderbilt quality control all the way

guarantees improved effectiveness for your Agricultural Dusts and Sprays. Vanderbilt carriers, diluents and dispersing agents have become foremost because of this quality standard.

PYRAX ABB is the most widely accepted and used Pyrophyllite in the agricultural field. An outstanding carrier for insecticides and fungicides, and many other applications.

DARVAN #1 & #2 are recognized as excellent dispersing and suspending agents for wettable concentrates. Tests indicate small amounts of Darvan increase the efficiency of the toxicant.

CONTINENTAL CLAY is a highly compatible and non-alkaline carrier for high bulk dusts. Equally remarkable is its dispersibility in wettable concentrates.

Vanderbilt quality control *all the way* has produced these fine products . . . through private Company development of its own properties and mineral rights . . . operation of its own manufacturing plants and processes . . . its own constant and rigid laboratory supervision . . . and its own technical sales and service staffs.

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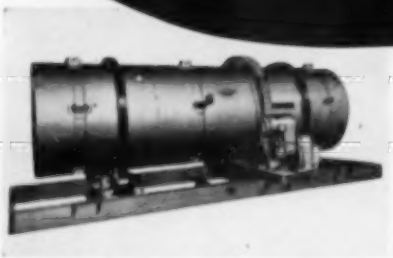
NAME_____

POSITION_____

(Please attach to, or write on, your company letterhead)

STURTEVANT FERTILIZER EQUIPMENT

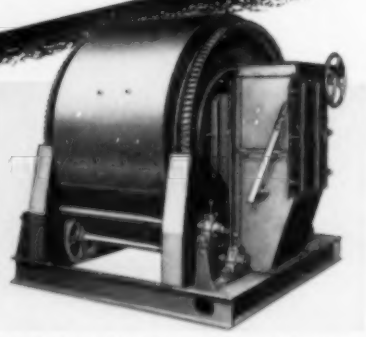
CUTS Cost of Fertilizer Manufacture



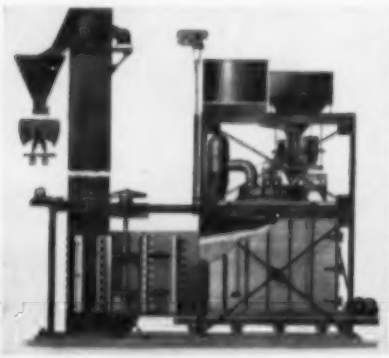
STURTEVANT FERTILIZER GRANULATING UNITS provide you with a complete process for manufacturing granular fertilizer. These efficient units can be supplied for various hourly tonnages and certain granule sizes depending on your particular requirements.



TAILINGS ROTARY PULVERIZER — increases output of fertilizer tailings . . . will not clog . . . leaves no daily accumulation of unground pellets. Capacities up to 25 tons per hour.



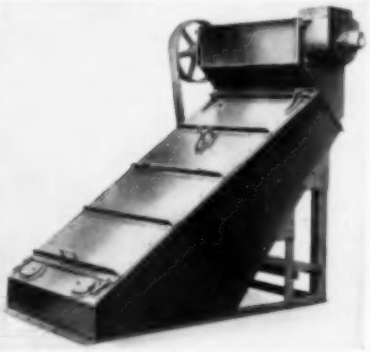
DRY BATCH MIXERS — 4-way mixing action mixes two or more ingredients into an inseparable, homogeneous blend. Open door accessibility makes cleaning easy. Capacities ¼ ton to 2 tons.



DEN AND EXCAVATOR—speeds processing of superphosphates. Easily operated by two men . . . produces 16 to 40 tons per batch and up to 480 tons per day of superior fertilizer free from lumps.



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MOTO-VIBRO SCREENS — screen everything screenable. Open and closed models with or without feeders. Many types and sizes . . . screens from ½" to 60 mesh.

For over 72 years, the Sturtevant Mill Company has been a leader in the design of plants and manufacture of fertilizer equipment. Equipment that has cut costs, increased tonnage throughout the industry.

Whether you plan to build a new plant, modernize or buy new equipment, it will pay you to consult Sturtevant Mill. Our engineers, specialists in fertilizer manufacture, are available for consultation. Ask for their services, today. You will keep ahead with Sturtevant.

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Suppliers' BULLETINS

Calif. Pest Control Guide

A summary of information related to vegetable and field crop insect and mite control in southern California was issued recently as News Letter #65 by the University of California, Riverside Calif. The 16-page bulletin discusses the control of various crop pests, field crop problems, warnings on plant damage, warnings on pesticide residues, and a listing of the California State regulations.

The section on pest control lists specific pests with detailed information on chemicals for control, rate and means of application. The vegetable and field crop section lists the various crops and, describes the pests attacking each crop, with recommendations for control.

•

Union Special Bulletin

A new illustrated bulletin entitled "Suspended Heat Bag Closing Machines" has been issued by Union Special Machine Co., Chicago manufacturer of industrial sewing machines. The bulletin describes a line of machines which are designed for cable suspension from overhead mounting.

Insecticide Formulation Bulletin

A new edition of the insecticide formulators' Manual was recently issued as technical bulletin No. 42 by the Emulsol Corp., Chicago. Formulation suggestions for many of the newer pesticides as well as the established ones are given in addition to other emulsification data.

•

New Insecticide Emulsifier

Ninol Laboratories, Inc., Chicago, has introduced a new product called Toximul 500 that is said to approaches the ideal goal of a universal agricultural emulsifier. Consisting of a blend of special anionic and nonionic surfactants, Toximul 500 operates by lowering the interfacial tension between the emulsifiable oil and water to a fraction of a dyne per centimeter. This extremely low tension is reported to favor spontaneous emulsification, and the toxicant liquid, therefore, disperses immediately into a white cloud of very fine globules when poured into water, reducing the necessity for vigorous agitation.

Toximul 500 gives oustanding results with at least a dozen different toxicants, using only three or four percent of emulsifier over a range of water hardness from 50-1000 ppm.

Detailed literature and samples are available from the manufacturers on request.

You don't guess - you KNOW!
. . . HOW MANY TONS OR POUNDS PER ACRE



***"NEW LEADER" METERING ATTACHMENT TAKES THE GUESS-WORK OUT OF SPREADING!**

With the "NEW LEADER" Metering Attachment you will now know exactly how many pounds of fertilizer per acre you are spreading. With the old method, the truck driver often spread the entire load of fertilizer before he realized he was spreading either too heavy or too light.
This Metering Attachment fits all late model "NEW LEADER" twin disc spreaders. It is inexpensive, easy-to-install, and accurately meters from 100 pounds to several tons per acre.
It is amazingly simple to operate and no fertilizer is spread on the ground until you are satisfied the spreader is accurately set for the correct amount per acre desired. This new Metering Attachment with the many other outstanding features of the "NEW LEADER" motor driven spreader, gives your customer the kind of consistent and uniform spreading job he expects.

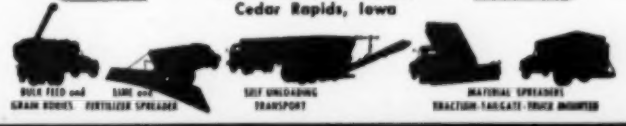
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Prove it To Yourself! Fertilizer Sells Better with a NEW LEADER Engine-Driven Spreader



NOW YOU CAN GET . . .

Republic top-quality Ammonium Sulphate BULK OR BAGGED—IN CARLOAD LOTS

Republic's free-flowing Ammonium Sulphate is now available in bulk form or bagged. It is ready to be shipped to you in carload lots promptly and at regular intervals.

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REPUBLIC AMMONIUM SULPHATE

SAFETY MEETING

(*From Page* 71)

Fertilizer plant management hardly realized that they did have an accident problem, he said, but the evidence that accident prevention results in increased profits has brought 95 percent of the state's fertilizer companies into the voluntary program to keep accidents down.

The service rendered by the state labor department, he explained, includes a survey of the type of accidents occurring in a plant over the previous three years; an on-the-job study of actual plant conditions; the supplying of posters, pamphlets and other educational material; and a checkup of the plant by a visiting safety inspector.

The outstanding cause of accidents in North Carolina fertilizer plants, he said, was found to be poor housekeeping. This, he said, indicates that good housekeeping is one of the vital elements of every plant's safety program.

Hazards With Ins.-Fert. Mixtures

IN a "Stump the Experts" symposium on the section's opening day program, some eight safety problems were discussed, but predominant attention was given to two in particular, namely the accident hazards in fertilizer-insecticide mixtures and in liquid nitrogen.

Fertilizer manufacturers are not enthusiastic about the trend toward mixing insecticides in with their products, the discussion brought out. But since the practice is growing, its hazards much be given more attention than they get at present.

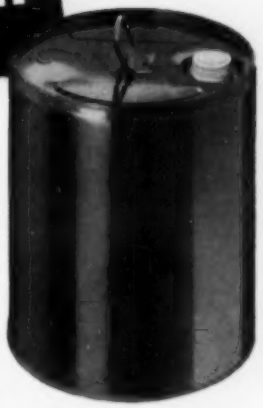
Curtis A. Cox, assistant manager, manufacturing dept., Virginia-Carolina Chemical Corp., Richmond, Va., pointed out that some of the newer insecticides are extremely toxic and not all fertilizer plants are properly equipped to handle the mixing process. His company, he said, has done some mixing of aldrin with fertilizers and, realizing its hazards, have provided employees with protective equipment. There is need, however, he said, for exact knowledge of what is the mimimum safe protection, in the way of respirators, gloves, etc., when such insecticides are involved. The main protective step, he said, is to insist on a thorough washup after the operation.

Further emphasis on the need for developing more knowledge on how to handle fertilizer-insecticide mixtures es was added by a speaker from the floor, who told of witnessing the delivery of a mixture by a truck driver who wore no goggles, no gloves, no respirator, and who proceeded about his job totally unaware of the potential hazards he faced.

Hazards in Handling Nitrogen Solutions

ELMER C. Perrine, engineering sales, Nitrogen Div., Allied Chemical & Dye Corp., N. Y., said, in discussing the handling of nitrogen solutions that it is a good idea to use the same precautions observed in handling gasoline, "even though they may be excessive in some ways and too mild in others."

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Yes, friends, we've got that SOUTHERN ACCENT, and that *accent* is on production of TOP-QUALITY Steel Pails and Drums and on SPEED of delivery . . . for SOUTHERN CUSTOMERS.

Large capacity and flexibility of production, a sizable warehouse stock of ALL popular sizes and types of Steel Pails, plus central location right in the heart of the Industrial South, assures quick deliveries when time means money to you.

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Vulcan makes a full line of Steel Pails and Drums to meet YOUR needs—1½ to 8 gallon sizes . . . open head or closed head . . . plain covers or those built with all popular pouring openings . . . special Hi-Baked Lined to protect your product . . . Open Head Lug Cover . . . Tight Head Drum Type.

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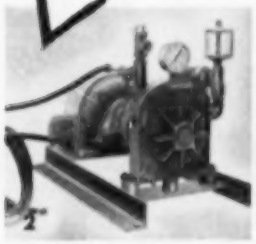
BIRMINGHAM ★ ALABAMA

HAVE YOU OVERLOOKED ANY OF THESE IDEAS?

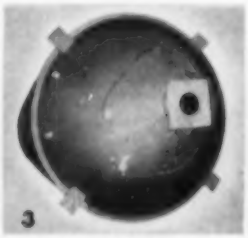
There are places in your fertilizer plants where low-cost Johnson accessories can profitably increase the efficiency of your bulk-material storage, batching and blending operations . . .



1 **Pivoted Distributor** feeds materials to multiple-section bins. Turns, locks by ground-level control.



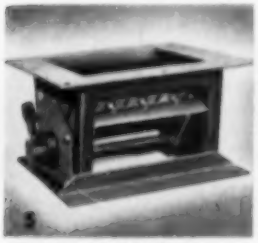
2 **Rotary Vane Compressor** supplies 7 cu. ft. air pressure per min. to aerate silos, bins. 15-lb. limit-relief valve.



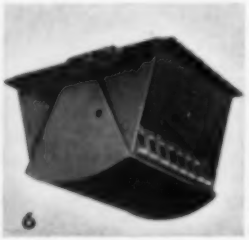
3 **Aeration Fittings** properly spaced in storage bins and silos keep bulk materials fluid, free-flowing.



4 **Bin Gauges and Signals** ● accurately register "hi-lo-levels". Automatic. Water and dust-proof.



5 **Rotary Plug Valve** controls flow of finest materials. Plug works freely in self-aligning bearings.



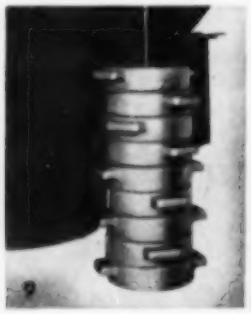
6 **Fill Valves** single-clam, radial-type, have choker weights on closing edge for jam-proof closing.



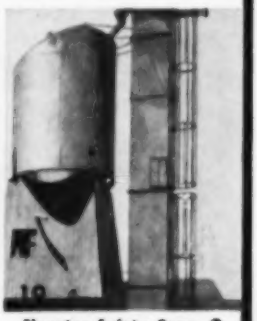
7 **Receiving Hoppers** all sizes, types for box-car, hopper-bottom car, truck, or bag delivery. Weather-tight.



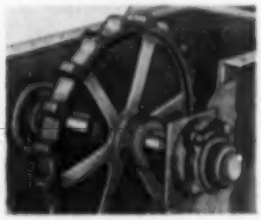
8 **Elevator Buckets** all-welded, light, smooth • Two types, 7 sizes. Steel chain has carburized knuckles.



9 **Batcher Test Weights** are available in sets of nine, 50-lb. calibrated units, and two 25-lb. steel hangers. ●



10 **Elevator Safety Cage** ● 28-in.-diameter ladder safety cage, welded to casing, costs only a few dollars per foot.



Chain Sprockets 19-tooth chilled-rim cast iron with heavy split hub; 12-tooth cast-chrome manganese.

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J 347 AC

People have learned to live with gasoline and all its hazards, including the deadly carbon monoxide fumes, he said, and if the dangerous characteristics of liquid nitrogen are understood, people can learn to show the proper respect for it.

All nitrogen solutions, he continued, contain some materials which, when dried, can burn or even explode if ignited. This points up the importance of cleaning tanks or piping thoroughly before temperatures above normal steam are applied. He spoke also of the need to be concerned about free ammonia which exists in all pressure-type nitrogen solutions. To make sure equipment is safe before applying heat, such as in welding, he emphasized, it should be as clean as when originally fabricated.

Don't Overequip For Safety

TOO much safety equipment can be as bad as too little, J. D. Acree, plant manager, Crawford Chemical Co., Bartelsville, Okla., said, in answering the question "Is it possible to have too much safety equipment?"

Too much can defeat its own purpose by arousing opposition by the worker, who, as soon as he is out of sight of the supervisor, discards the protective device. Improper and inefficient equipment can also give the worker a false sense of security, he said. When the worker is furnished the proper safety equipment, he suggested, he must also be given an understanding of its purposes and limitations.

How to handle dynamite safely was the topic of Wm. H. Henderson, general manager, Cooperative Plant Foods, Schererville, Ind. The final speaker on the Monday symposium was Wm. E. Powell, division manager, loss prevention dept., Liberty Mutual Ins. Co., Chicago, who outlined a "minimum medical program" for a fertilizer plant.

Speaking at Tuesday's luncheon session, the section's general chairman-elect for the coming year, Thomas J. Clarke, urged members to "put our program to work." Magazines, he commented, carry articles, complaining of the lack of young executives

to carry on the nation's business. The fertilizer section's annual conference, he declared, is "one of the finest training grounds available for training young men for future executive positions. If the industry would use the section's services and facilities, its need for young executives could be fully met," he concluded.

At the Tuesday luncheon, Mr. Clarke presented to retiring chairman Vernon S. Gornto, a certificate signed by Ned Dearborn, president of the National Safety Council, expressing the Council's appreciation for his unselfish devotion to promotion of the organization's principles during his term of office.

In a talk on "The Job Ahead" R. J. Rhinehart, executive of the Arkansas Power & Light Co., Little Rock, Ark., recited the figures on last year's accident toll and declared that, since the average citizen does almost nothing about the death and destruction due to carelessness, that becomes the job of those present at this National Safety Congress. Continuing, he outlined a comprehensive program for promoting the industrial worker's safety.

Training aids available through the National Safety Council for promoting accident prevention work in fertilizer plants were presented by R. R. Murray of Swift & Co's plant food division, and following him, John Miskelly, director of safety and plant protection for the Olin Mathieson Chemical Corp., Baltimore, Md., demonstrated some of the ingenious "gadgets" he has contrived for use in their plant safety work.

In a continuance of the previous day's "Stump the Experts" symposium, the hazards of handling anhydrous ammonia were discussed at some length by Charles McDaniel of Lion Oil Co. He blamed some of the trouble experiences in southern states with the T.V.A. ammoniator, to "the fast buck folks" who sold equipment not bearing the code stamp of approval. He also discussed laws affecting use of anhydrous ammonia in force now in Mississippi, Louisiana and Arkansas.

Duncan MacDonald, safety engineer, Anaconda Copper Mining Co., Anaconda, Mont., confined his talk on "Triple Superphosphate and Acid Handling," to an account of the practices followed to protect his own company's workers. A plexiglass housing is used, he said, around points where accidents might result when equipment is being adjusted. Protective clothing of synthetic materials is also used, in place of the wool garments formerly worn. Guarding machinery is difficult, but, he said, employees can be educated to understand and appreciate the hazards of their jobs.

Time was growing short so that several panel members could speak only briefly. These included spokesmen for three farmer supply cooperatives, John Marx, Iowa Farm Supply Co., Des Moines, Ia.; A. E. Johnson, Illinois Farm Supply Co., Chicago; Grayson B. Morris, Southern States Cooperative, Richmond, Va., and M. H. Talbott, Kingsbury & Co., Indianapolis, Ind.



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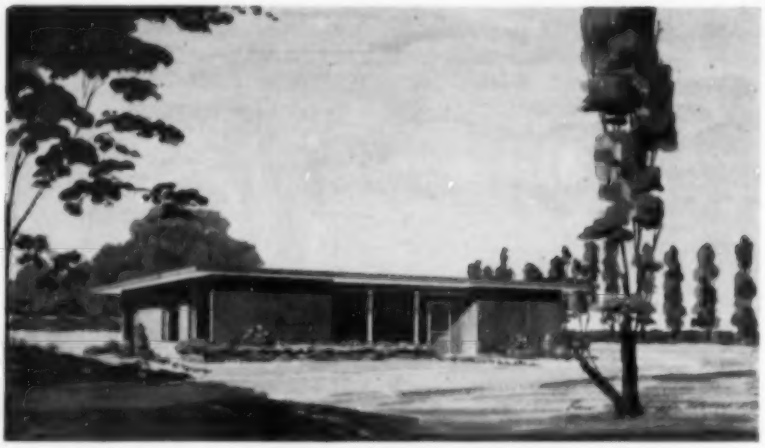
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FOLLOWING what we believe we recognize as a nation-wide trend toward decentralization of industry . . . moving out of the crowded cities into suburban areas . . . AGRICULTURAL CHEMICALS will move its offices about December 1 to new quarters in Caldwell, N. J. We will occupy our own new building which has been designed specially for us, with the requirements of the trade paper publishing business kept particularly in mind. Our new offices are located about fifteen miles due west of midtown Manhattan, and may be reached via the Lincoln Tunnel and routes 3 and 46 in about twenty-five minutes from New York City.

Please change your records now, and after December 1 address all correspondence to us c/o *Box No. 31, Caldwell, N. J.* Advertising plates should still be forwarded direct to our printer, *Watkins Printing Co., 123 Market Place, Baltimore 2, Md.*, but insertion orders and general correspondence should go to the Caldwell address.

We shall of course be happy to have our friends visit us at the new quarters.

NEWS Brevities

NEW AEROSOL LIVESTOCK spray of Tru-Pine Co., Chicago, contains methoxychlor and pyrethrum. 12-ounce can retails for $1.69. Said to be effective against horn flies, house flies and mosquitoes.

* * *

HOWARD E. MILIUS joined Millmaster Chemical Co., New York, as manager of product development, Robert J. Milano, president, announced in October. Mr. Milius formerly was sales manager for Humphrey-Wilkinson, Inc., chemical manufacturer of North Haven, Conn.

* * *

NEW PRESIDENT and member of the board of directors of American Aerovap, Inc., New York, is F. F. Winberg. Mr. Winberg will direct the company's expanded activities in the field of controlled vaporization of insecticides.

* * *

PARATHION cannot be sold or used within the city limits of Sarasota, Fla., an emergency ordinance in the city states. The law prohibits the sale or use of the pesticide or other toxic organic phosphate chemicals.

* * *

CONNECTICUT Agricultural Experiment Station was honored last month by the Federated Garden Clubs of the state with an award of merit for its cooperation and assistance to the Federation. The Station was one of three institutions so honored, the others being the University of Connecticut and Connecticut College at New London. A bronze medal was presented to Dr. Arthur H. Graves, consulting plant pathologist at The Connecticut Agricultural Experiment Station, for his work with chestnut trees.

CONSOLIDATED Mining & Smelting Co., of Canada, announced last month that, for the first time in its history it is selling ammonium nitrate in liquid form. Initial delivery was a 2,600 gallon tank truck load of the solution delivered to the Columbia Basin area in Washington state.

* * *

GALLOWHUR CHEMICAL CORP., New York, announced last month the grant by the U. S. Patent Office of Reissue Patent No. 23,863 dated Aug. 31, 1954, pertaining to solutions of organic mercury compounds for use in agricultural sprays, slimicides, and other products for agricultural and commercial use. The original patent was 2,411,815, issued November 26, 1946. The solutions covered by the claims of the Reissue Patent have been found to be extremely effective in use and represent an important development of the Gallowhur Chemical Corporation and Dr. Frank J. Sowa, manufacturing chemist and consultant, according to the company.

* * *

WALTER JACOB has left the agricultural department of Cornell University to accept a position as statistician in the agronomy department at the University of Illinois.

* * *

KINGMAN LIQUID Fertilizer, Inc., Kingman, Kansas, was recently incorporated for the manufacture of commercial fertilizers.

* * *

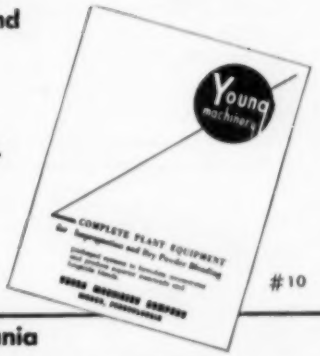
G. M. BASFORD Co. will handle sales and promotion of molybdenum produced by Climax Molybdenum Co., New York, in agriculture and other fields, the company announced last month.

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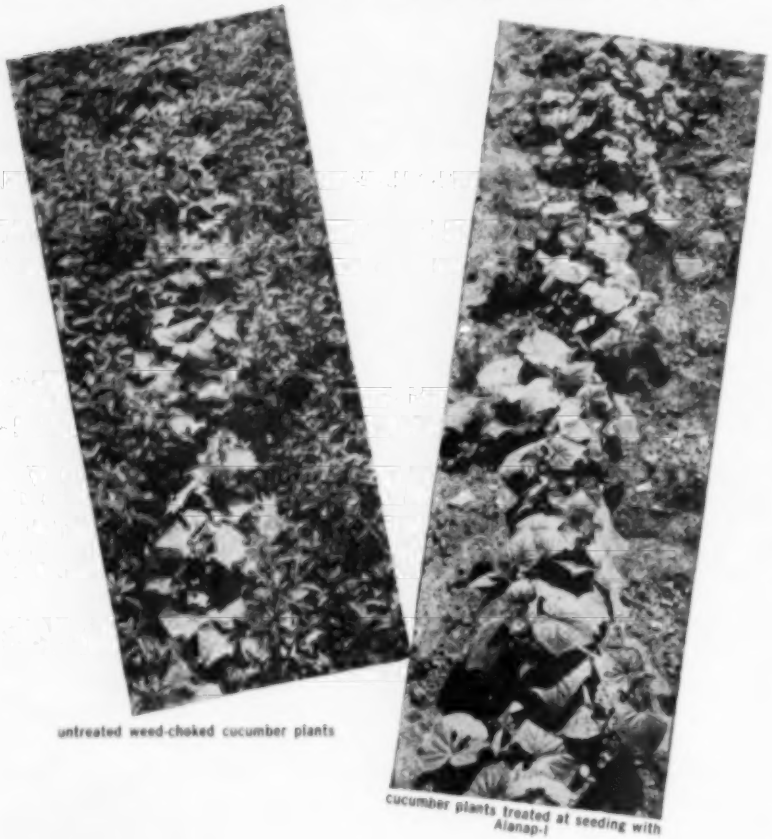
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One experiment reveals that *curcurbit yields were actually doubled by a pre-emergence application of Alanap-1.* "Plants in untreated rows were severely stunted by weed competition before the fields could be cultivated and hoed, whereas treated rows were still not suffering... two months after planting."

As a pre- or post-emergence weed killer, Alanap-1 gives excellent control of a wide variety of weeds, is non-hazardous to humans and animals, easy to apply, low in cost, and safe on recommended crops *which now include asparagus.*

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CONDITIONER RULES

(Continued from Page 90)

ment of their products; Imitation of Trademarks, etc.; Misrepresentation as to character of business; Procurement of competitors' confidential information; Selling below cost; Prohibited discrimination; Prohibited forms of trade restraints—(unlawful price fixing); Aiding or abetting use of unfair trade practices.

WASHINGTON REPORT

(From Page 78)

the National Fertilizer Association is one evidence. Certainly the proposal has been receiving widespread attention and much support. This is the type of negotiation which calls for statesmanship of the highest order.

Another sign of change is the recent meeting of a committee to consider whether government tax aid is needed to get the right storage facilities for nitrogen. Even a poor memory can recall the days when the big drive was to get more nitrogen plants built. Many a storm was raised and the cry went out to build.

Industry has built and is still building. So much so that Life magazine carries big spreads on this wonderful "discovery" called nitrogen. More companies are joining the field. Production has increased so much so that the big aim is to sell. Part of selling is maintaining a good supply and that means storage. Chances are you'll be involved in nitrogen storage problems for some time.

Some parts of the industry want the government to step in. Others say no. At this moment, the no's appear to have it. But from what we hear, the situation is fluid.

Howard W. Doerr, president and treasurer of the American Superphosphate Institute Inc., is beginning to strengthen the voice of this fertilizer ingredient which is, as he says, in the middle. Active sales programs by both the nitrogen and potash interests are seen as a challenge by more and more of the phosphate companies. Some of them feel they must restate the value of phosphorous and build a broad enough platform so it can hold all those who should be talking phosphorous. Those happy

days when the much recommended grades of fertilizer were 2-12-6 and the like seem to be getting a bit dim.

The Institute is not, by its policy only for the "normal" group. Rather, membership is open to the broad community of interest among all manufacturers of phosphorous. Doerr expects membership to grow from its initial nucleus in the South. Part of the Institute's present activity is connected with foreign trade, with the goal of increasing exports. We feel the scope of activity of this group is due to increase and that its influence will be a major factor in the phosphate field.

"In magazines, newspapers, by radio and television, the chemical industry is telling the farmer not only how he can benefit from the use of chemical products, but specifically names the products, tells him where he can buy them, and in many cases just how he can use them," said R. N. Cascella speaking for the National Agricultural Chemicals Association at the Washington meeting for twenty South American publishers and editors who will be in the U. S. for over a month studying the various media and methods we use to reach farmers with news about farm supplies and farm operations. This trip is sponsored by the Foreign Operations Administration under the direction of Dana Reynolds, with Layne Beaty serving as technical consultant. NAC staged a popular attraction by presenting its views to the Latins in Spanish. This reversed the tables and the U. S. industry representatives there were forced to follow the English translation in printed form or enjoy the chant of their Spanish speaking representative.

Lea S. Hitchner, NAC executive secretary, invited members of the foreign trade committee to attend the meeting which was held in cooperation with the American Plant Food Council and the National Fertilizer Association.

The information program of the American Plant Food Council as it relates to radio and special tours was presented by Louis H. Wilson, secretary and director of information. He told about these activities in ways which were intended to be especially helpful to the South American visitors.

Delbert L. Rucker, director of information of the National Fertilizer Association featured the development and use of slides in his talk pointing out how NFA depends on this method as one important means of getting information to farmers. One of the government representatives remarked on the great interest shown by the visitors as evidenced by the questions which followed the meeting. The response was most gratifying.

The National Fertilizer Association's new book, "The Care and Feeding of Garden and House Plants," seems ideally timed for issuance for big Christmas sales. From what I've seen of the advance text and general layout, it seems like just the thing home gardeners have been looking for.

The many pages of full color plates of plant food deficiencies, plus plates showing the effect of compacted soil and the ravages of mite damage are made to order for the home garden enthusiast.

One great service the book can perform is to answer the questions about organic matter for the home gardener. It's too bad that the fertilizer industry gets blamed for all the sub soil bulldozed by the builder and then seeded or left for some poor gardener to fight for "the best ten years of his life." When chemical fertilizer is added to hard clay of low organic content, little or no benefit is derived. Add manure to the same soil and you get much more spectacular results. All soil scientists know why. But it is a difficult story to tell to the gardener.

This book will help the gardener because it conveys basic information of practical use to the individual. What's more it does it in an interesting manner.

I predict that this book will be even more popular, and in the broad sense, even of greater value to the entire fertilizer industry, than its illustrious and valuable predecessor, "Hunger Signs in Crops." There are more gardeners than farmers.

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INDUSTRY *Patents*

The information below is furnished by patent law offices of

LANCASTER, ALLWINE & ROMMEL

402 Bowen Building
Washington 5, D. C.

The data listed below is only a brief review of recently issued pertinent patents obtained by various U. S. Patent office registered attorneys for manufacturers and/or inventors. Complete copies may be obtained direct from Lancaster, Allwine & Rommell by sending 50c for each copy desired. $1.00 for Canada. They will be pleased to give you free preliminary patent advice.

2,689,173. Process of Treating Soil. Patent issued Sept. 14, 1954 to Edgar W. Clarke, Laurel Spring, N. J., assignor to The Atlantic Refining Co., Philadelphia, a corporation of Pennsylvania. A process for treating soil to enhance the water penetration and retention characteristics thereof and to stimulate the growth of vegetation, which comprises applying to said soil an alkyl benzene sulfonate having from 9 to 15 carbon atoms in the alkyl group.

2,689,174. Herbicides. Patent issued Sept. 14, 1954 to Jonas Kamlet, Easton, Conn., assignor to Mathieson Chemical Corp., a corporation of Virginia. A method of selectively destroying undesirable vegetation in an infested area which comprises applying to the infested area a composition comprising a water-soluble salt of methylenebis- (iminosulfonic) acid in a concentration of about 0.5 to 15 weight per cent on the composition.

2,689,175. Production of Nitrogenous Fertilizers. Patent issued Sept. 14, 1954 to Samuel Strelzoff and Edward S. Roberts, New York, N. Y., assignors to Chemical Construction Corp., New York, a corporation of Delaware. A method of simultaneously producing ammonium phosphate and ammonium nitrate fertilizers which comprises digesting ground phosphate rock at about 80-100°C. in an aqueous digestion liquor containing a quantity of nitric acid approximately equal to the weight of said rock and a quantity of ammonium sulfate chemically equivalent to the calcium content thereof and thereby producing a filterable slurry of calcium sulfate in an aqueous solution of phosphoric acid and ammonium nitrate, filtering said slurry and thereby obtaining a filtrate and a calcium sulfate filter cake, suspending said filter cake in water and injecting carbon dioxide and ammonia and thereby forming a slurry of calcium carbonate in a water solution of ammonium sulfate, separating the ammonium sulfate solution from said slurry and returning it to the digestion step, introducing sufficient ammonia into said filtrate to bring it to a pH of about 3.5, evaporating water therefrom and cooling to form crystals of ammonium phosphate, filtering off and drying said crystals and thereby producing an ammonium phosphate fertilizer, and further concentrating the filtrate from said last-mentioned filtering step and recovering an ammonium nitrate fertilizer therefrom.

2,689,201. Lindane and Tri-Alkyl Phosphate Insecticide. Patent issued Sept. 14, 1954 to James W. Hansen, Berkeley, Calif., assignor to California Spray-Chemical Corp., Richmond, Calif., a corporation of Delaware. An insecticidal composition comprising as an active toxic component a synergistic combination of the gamma isomer of hexachlorocyclohexane and a trialiphatic ester of phosphoric acid, selected from the group consisting of triethylphosphate and tri(chloroethyl) phosphate which are present in a weight ratio of said trialiphatic ester of phosphoric acid to said gamma isomer of hexachlorocyclohexane in the range of from 1 to 10.

2,689,780. Method of and Apparatus for Producing Ammonium Phosphate. Patent issued Sept. 21, 1954 to Owen Rice, Upper St. Clair Township, Allegheny County, Pa., assignor to Hall Laboratories, Inc., Pittsburgh, Pa., a corporation of Pennsylvania. A method of producing crystalline ammonium metaphosphate as a dry free-flowing powder that consists in supplying elemental phosphorus to a combustion chamber and supplying air to the phosphorus at its point of delivery to the combustion chamber, the ratio of air supply rate to the rate of supply of phosphorus being such that the phosphorus is burned to phosphorus pentoxide, feeding the phosphorus and combustion air to the combustion chamber at such rates that the temperature resulting from the reaction of air and phosphorus maintains

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You'll find that Koppers Company is a dependable source of supply for ammonium sulphate. Get in touch with us concerning your requirements.

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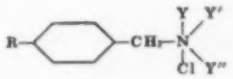
Celatom is also an excellent carrier for toxicants such as Malathion . . . as a diluent for many types of insecticides . . . as an absorbent for chemicals that control seed diseases . . . scores of other applications. Celatom's flow quality, high bulk and other properties give a more effective and uniform "spread" . . . do not reduce the toxic action of the "kill."

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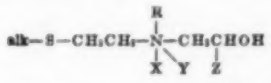
the reaction product phosphorus pentoxide in a gaseous state, discharging the phosphorus pentoxide from the combustion chamber into a reaction chamber, introducing atmospheric cooling air and ammonia into said reaction chamber, the ammonia being supplied at a rate sufficient to react with the phosphorus pentoxide and the water supplied thereto by said cooling air and the water in said combustion air to form ammonium metaphosphate, discharging the ammonium metaphosphate into a collecting chamber, supplying cooling air into the collecting chamber adjacent the point of entry thereinto of the ammonium metaphosphate and so regulating the amounts of cooling air supplied to said reaction chamber and to said collecting chamber that the temperature of the ammonium phosphate in the collection chamber is not more than about 450°F.

2,689,789. QUATERNARY NITROGEN COMPOUND HERBICIDES. Patent issued Sept. 21, 1954 to David T. Mowry and Arthur H. Schlesinger, Dayton, Ohio, assignors to Monsanto Chemical Company, St. Louis, Mo., a corporation of Delaware. A herbicidal composition comprising an oil-in-water emulsion of a quaternary nitrogen compound having the formula

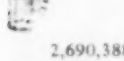


in which R is an alkyl radical of from 5 to 9 carbon atoms, Y and Y' are alkyl radicals of from 1 to 5 carbon atoms and Y'' is selected from the class consisting of phenyl radical and alkyl radicals of from 1 to 5 carbon atoms, said nitrogen compound being present in said emulsion in a quantity which is toxic to plant life.

2,689,790. NITROGENOUS COMPOUND HERBICIDES. Patent issued Sept. 21, 1954 to David T. Mowry and Arthur H. Schlesinger, Dayton, Ohio, assignors to Monsanto Chemical Company, St. Louis, Mo., a corporation of Delaware. The method of destroying undesirable plants which comprises applying to said plants a toxic quantity of a herbicidal composition comprising an inert carrier, and, as the essential active ingredient a quaternary nitrogen compound having the formula:



in which alk represents an alkyl radical of from 8 to 16 carbon atoms, X is selected from the class consisting of chlorine and bromine, Z is selected from the class consisting of hydrogen and the methyl radical, R is an alkyl radical of from 1 to 4 carbon atoms, and Y is selected from the class consisting of R and the radical



2,690,388. SEED GERMINATION. Patent issued Sept. 28, 1954 to William J. Hale, Midland, Mich., assignor to Verdurin Company, Detroit, Mich., a corporation of Michigan. A method of improving the sprouting and growth of seeds, roots and bulbs which comprises applying to the surface of the seeds, roots and bulbs an inert carrier material containing a porphyrin metallic complex and a gamma pyrone compound.

New Trademarks

CURE-AID, for wetting agent used in the curing of fertilizer. Filed P. R. Aug. 10, 1953. Am. S. R. Feb. 4, 1954, by Seydel-Wooley & Co., Atlanta.

MIDCO, in italics, for parasiticides and fungicides. Filed Feb. 18, 1954, by California Spray-Chemical Corp., Wilmington. Use since Aug. 1, 1953.

ACTI-TABS, for fungicide for the control of parasitic plant diseases. Filed Feb. 18, 1954, by The Upjohn Co., Kalamazoo, Mich. Use since Nov. 9, 1953.

ACTISPRAY, for fungicide for the control of parasitic plant diseases. Filed Feb. 18, 1954, by The Upjohn Co., Kalamazoo, Mich. Use since Oct. 23, 1953.

FISH FLUFF, in stencil letters, for fertilizer. Filed Dec. 28, 1953, by Van Camp Sea Food Co., Inc., Terminal Island, Cal. Use since May 23, 1952.

COMPLESOIL, in capitals, for fertilizers. Filed March 1, 1954, by Farbwerke Hoechst Aktiengesellschaft, vormals Meister Lucius & Bruning, Frankfurt am Main Hochst, Germany. Use since Dec. 18, 1953.

SOLONEX, in capitals, except letter "e" for soil conditioner. Filed Feb. 15, 1954, by Hydroponic Chemical Co., Inc., Copley, O. Use since Feb. 2, 1954.

(*Turn to Page* 124)

CONTROL OFFICIALS

(*From Page* 58)

He added that the high national income and declining farm surpluses will "set the stage for farming in 1955." As for the fertilizer industry, he predicted production would stay high and that expansion would continue, with greater emphasis placed on high analysis mixtures.

Rodney C. Berry, control official from Virginia, speaking on the topic of public relations, said the daily activities of control officials should be guided by good public relations principles. "There hasn't been a court case in Virginia in 50 years involving the fertilizer industry," he stated, as

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evidence of good public relations in the state.

Walter Scholl, of USDA, quoted figures on non-farm consumption of fertilizers which are going to the home garden market. He said the shorter work week and other factors give the home owner more time to take up home gardening. Manufacturers of products aimed at this group are located largely in the North Atlantic, East North Central and South Atlantic regions, he said.

John D. Conner, attorney for the National Agricultural Chemicals Association, talked about warning and caution statements. His complete paper is printed elsewhere in this issue.

"More attention should be given to fertilizer placement," Dr. W. L. Nelson, of North Carolina State College, said in a talk on that subject. Many factors affect fertilizer placement, he reminded, including plant, soil and nutrient characteristics. One important trend in application is the early use of fertilizers, in late fall or spring, according to Dr. Nelson.

The pesticide officials, meeting Saturday, answered their problems this way:

1. They are generally opposed to getting into the field of controlling herbicides, although several officials said they are doing the job in their states.

2. Coming to grips once again with the problem of finding a satisfactory definition for the word "concentrate," the officials scrapped the one adopted last year ("purest commercially available material") after widespread industry complaints, and tentatively adopted one which states that a concentrate in the brand name will be considered misleading unless percentage of principal ingredient is given, the weight per volume is stated, or information is given concerning dilution ratios.

3. Perhaps the most important problem, to the officials and to the pesticide industry as a whole, is that concerning highly toxic materials. These products, including 1080, fluoroacetate and organic phosphates like parathion, have caused much concern among the public. Dr. Lemmon urged a long and thorough educational program by industry before introduction of highly toxic products. "Otherwise," he declared, "inflamed state legislatures will declare the products illegal." Dr. Lemmon and several other officials said that, in any case, these highly toxic materials should be kept away from the home garden market.

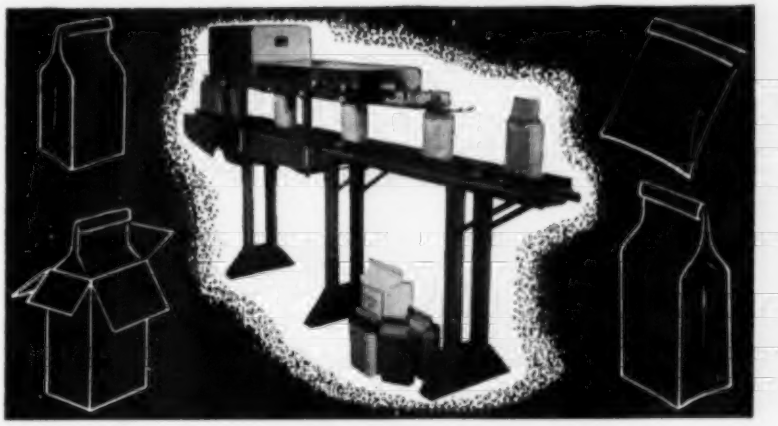
In the formal addresses, Floyd Roberts, of North Dakota, retiring president of AEPCO, said that one of the biggest problems of the pesticide industry—that of overproduction and resultant deterioration of products—also is of concern to the officials regulating these materials in the states. He said fertilizer-pesticide mixtures seemed to be the coming thing, and that the group should be considering appropriate ways to control them.

Dr. Philip J. Spear, technical director of the National Pest Control Association, outlined the work of the group and said it likes to work with control officials wherever possible. He said his group uses pesticides with great care so that carelessness and public misuse will not result in heavy restrictions being placed on the pesticide industry and its products. He said the NPCA encourages studies of resistance and other problems that confront the pesticide industry.

Dr. M. R. Clarkson, Agricultural Research Service, USDA, reviewed recent developments in pesticide regulation, presenting, in detail, the important points in the Miller Pesticide Amendment. "Effective legislation helps the industry by cutting out cheats and adds to industry prestige," he asserted.

The NAC, CSMA and MCA held open house for the pesticide control officials, despite Hurricane Hazel, which blew in two windows in the association suite.★★

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TABLE 3

Emergence (mean* number of plants) in vegetable seed treatment test in the winter of 1952-53 at Baton Rouge, Louisiana

Treatment	Emergence									
	Beet	Carrot	Eggplant	Pea Thos. Laxton	Pea Alaska	Mustard	Pepper	Radish	Spinach	Tomato
Untreated check	9.3	75.5	69.8	82.0	84.8	60.0	98.3	145.3	19.5	120.0
Arasan	161.3	138.5	82.8	96.8	94.5	124.5	136.0	138.8	82.3	138.0
Dow 9 B	171.3	94.3	54.8	—	—	116.5	33.8	19.0	82.5	97.0
Orthocide 75	176.3	154.0	87.0	95.3	92.8	127.8	136.0	147.5	45.5	139.5
Phygon	167.0	141.8	76.3	—	—	121.5	138.0	138.3	71.5	142.8
Spergon	129.5	114.5	5.0	93.0	—	113.3	119.3	137.5	50.5	86.0
Semesan	164.0	130.3	84.5	—	—	114.3	113.3	142.0	36.3	133.3
Thiram	129.3	141.8	78.0	—	—	135.3	133.0	143.3	75.3	136.0
Vancide 51 ZW	165.5	120.5	77.0	91.8	93.5	135.8	140.0	136.8	57.3	139.0
L.S.D. 5%	34.2	N. S.	16.0	N. S.	N. S.	31.5	19.0	10.2	27.2	26.0
1%	45.8	N. S.	21.5	N. S.	N. S.	42.2	25.8	13.6	36.5	35.4

*Mean of four replicates in each case.

SEED TREATMENTS

(*From Page 65*)

Orthocide 75 and Semesan were not different from the check. Spergon resulted in significant increases.

Tomato: None of the treatments resulted in significant increases in emergence over the check. The Dow 9 B and Spergon treatments resulted in a significant decrease in emergence.★★

INSECT CONDITIONS

(*From Page 67*)

more widespread infestation, as yet unverified. It is felt that if the current generation of larvae overwinter instead of producing a flight of moths this fall, a serious situation may develop again next year.

The European red mite was depositing eggs on apple fruit generally over the state of Pennsylvania during the latter part of September. In Utah, the mite was still causing damage in northern Utah orchards as well as in some orchards in Washington county which is in the southwestern area of the state. A mite, *Vasates fockeui*, has been more abundant on cherries than normal in the Dallas, Ore., area. It has also been abundant on cherries in the Wenatchee, Wash., area. The peach silver mite was also abundant on Lodi apples in the Wenatchee area.

Codling moth injury to apples increased during late September in both Michigan and Ohio. Infestations in many Utah orchards were more severe than expected, due in part to an extended moth emergence. Other fruit insects causing more than normal damage included apple aphids in the Hood River, Ore., area, where damage to the terminal shoots of small trees was of particular importance. New growth on both young and old citrus trees was damaged by the citrus thrips in Arizona.

The apple maggot was more abundant than usual throughout Wisconsin and was very destructive where complete spray schedules were not followed. In Florida, the Florida red scale was expected to be more

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troublesome during the fall months than for the past two years, but was not expected to be as serious as in the fall of 1951. A heavy infestation of the European fruit lecanium ruined the peach crop in an Albemarle county, Va., orchard.

Due to the lateness of the season and general maturity of crops, most cereal and forage insect activity dropped off sharply during the month, however, some persistent pests such as corn earworm, lesser cornstalk borer, and fall armyworm continued to cause important damage in some areas.★★

NEW TRADEMARKS

(*From Page 119*)

FERAN, in capitals, for fertilizer in solution form for direct application. Filed March 5, 1954, by Allied Chemical & Dye Corp., New York. Use since Nov. 2, 1953.

NOTT'S SOILIFE, with wavy line on each letter, and word "Nott's" disclaimed apart, for soil conditioning agent containing mainly polyacrylonitrile. Use since on or about May 14, 1952.

GY GRENE, in capitals, for fertilizers. Filed May 14, 1953, by Geigy Co., Inc., New York, now by merger and change of name Geigy Chemical Corp. Use since April 2, 1953.

BEM BRAND NODULATED, with words "brand nodulated" disclaimed except as they appear in complete trademark, for fertilizer. Filed June 15, 1953, by Thurston Chemical Co., Joplin, Mo., to Thurston Chemical Co., Division of W. R. Grace & Co., Joplin, Mo. Use since Feb. 16, 1953.

AGRITRACIN, in capitals, for antibiotic plant growth stimulant and blight control agent. Filed Dec. 31, 1953, by S. B. Penick & Co., New York. Use since on or about June 3, 1953.

METASYSTOX, in capitals, for organic phosphate systemic insecticide for agricultural use. Filed May 10, 1954, by Chemagro Corp., New York. Use since April 9, 1954.

AGRIMYCIN, in capitals and small letters, for antibiotic preparation for agricultural use for controlling plant diseases. Filed Nov. 16, 1953, by Chas. Pfizer & Co., Inc. Use since July 22, 1953.

M S Co., with drawing of mushrooms, for fungicides and insecticides. Filed May 20, 1954, by Mushroom Supply Co., Toughkenamon, Pa. Use since September, 1942.

APPLICATION EQUIPMENT

(*From Page 41*)

after exposure to 62½ gallons of a slurry containing five pounds of diluent per one hundred twenty-five gallons of water, pressure one hundred ninety-five pounds per square inch.

The formulation chemist thus has the task of balancing his needs for small particle size, absorbency, pH, etc., against abrasion.

Machinery Paints[3]

THE exterior finish of the spray tank frequently presents a difficult problem to the user because he cannot keep paint on it. Due to the high solvent action of certain formulations, a small amount of spillage will

TABLE I[1]

Sprayer and Duster Components Affected by Pesticides

Company No.	Tank	Hose	Pump	Spray Nozzle	Boom	Valves	Filters	Duster Hopper	Fan	Fan Case	Duster Nozzle	Gaskets
1	A	B	C	B	C							
2	A	B	C	C	C		C					
3	A	B	B	B	B							
4	A	B	B	B	B		C	C	C	C		
5								B			B	C
6	A			B						C	C	
7								C	C		C	
8	A											C
9		B					B	B	B	C	B	
10	A	C	B									
11	A	B	B									
12		B	B									B
13	A	B	C									
14	A	A	B	B		C	C					
15	C		C	C			C					
16	A	B	B	C								
17	A	B	B									
18	A	C	B	C								
19	C	C	B	A								
Totals	13A	1A	0A	0A	0A	0A	0A	0A	0A	0A	0A	0A
	0B	10B	10B	5B	2B	0B	0B	2B	1B	0B	2B	1B
	2C	3C	4C	4C	2C	1C	4C	2C	2C	3C	2C	2C

A = Most important problems.
B = Problems of secondary importance.
C = Minor problems.

NOTE: The above table is based on information received during interviews at the various equipment companies.

result in removal of the paint from the tank, with attendant exposure of the steel surface. Rusting of the tank can then begin from the outside to speed up the deterioration process.

Tests have been conducted at Dow Chemical Co. to learn if there were finishes available resistant to agricultural chemical formulations. These tests were designed to find exterior machinery paints that would resist attack by most solvents yet would be simple to apply. The tests were not designed to determine if these paints were satisfactory for interior tank finishes. Eight paints were tested for resistance to agricultural chemicals. They are:

1. *Styronated Black #100-A-532.* A styronated dehydrated castor oil vehicle type paint. Manufactured by the Cook Paint and Varnish Co.
2. *#560 Latex Penkote.* A latex type paint manufactured by the Peninsula Chemical Co.
3. *Petrolox.* A vinyl acetate-type paint manufactured by A. S. Harrison and Co.
4. *Linetite.* A vinyl type paint manufactured by the Plastic Lining Co., Chicago.
5. *Chlorinated Rubber #165.* A chlorinated rubber paint manufactured by Sherwin-Williams Co.
6. *Tropical Orange.* A Bakelite finish-type paint manufactured by the Tropical Paint Co.

TABLE II

Resistance of Painted Surfaces to Various Agricultural Chemicals—64 Day Test

Test Solutions and Concentration	1. Styronated Black #100-A-532	2. #560 Latex Penkote	3. Petrolox	4. Linetite	5. Chlorinated Rubber	6. Tropical Orange	7. #60-5079 Styronated Green	8. Aluminum (Varnish-type)
mil thickness	4.3-4.8	3.5-3.7	2.3-2.5	-----	-----	3.0-3.1	1.9-2.1	-----
2,4-D WEED KILLERS								
isopropyl ester 3 1/3# acid eq./gal. undiluted	C	A	A	A	C	A	C	A
isopropyl ester 3 1/3# acid eq./gal. 1 gal. per 40 gal. water	A	A	C	A	B	A	B	A
Alkanolamine salt formulation 4# A. eq./gal. undiluted	B	A	B	A	B	—	—	—
Alkanolamine salt formulation 4# A. eq./gal. 1 gal/40 gal H_2O	A	A	A	A	B	—	—	—
Propyleneglycol butyl ether ester 4# A. eq. per gal. undiluted	C	B	B	C	C	B	C	B
Propyleneglycol butyl ether ester 4# A. eq. per gal. 1 gal/40 gal. water	A	A	A	B	C	B	C	C
2,4,5-T WEED KILLERS								
Propyleneglycol butyl ether ester, 4# A. eq. per gal. undiluted	C	B	A	B	C	B	C	B
Brush Killer 2#, 2,4,5-T as the propyleneglycol butyl ether esters, undiluted	C	B	B	C	C	B	C	B

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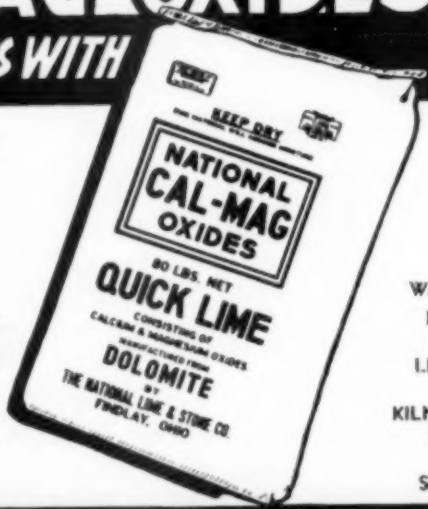
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7. #60-5079 *Styronated Green.* A styronated oil type paint. Manufactured by the Grand Rapids Varnish Co.
8. *Aluminum.* A varnish-type aluminum paint.

All paints were applied to sand-blasted steel panels 6" x 8" x 1/8" thick with recommendations of the manufacturer being followed in each case. All paints are of the air-drying type and do not require baking.

The test solutions were applied to the panels at the start of the test at the concentrations indicated. The panels were then aged, periodically examined, washed in running water, dried and re-treated. This was done four times. Observations covered a period of 64 days exposure. The results are shown tabulated in Table II.

The formulations tested are predominantly herbicides; however, the information obtained from the emulsifiable 2,4-D and 2,4,5-T ester formulations is meaningful for all agricultural formulations based on the use of a highly aromatic solvent in the formulation. For example, a 25% DDT emulsifiable formulation would be expected to be as hard on a paint as the four pounds acid equivalent per gallon formulation of the propyleneglycol butyl ether ester of 2,4-D because of the common use of an aromatic solvent in both formulations.

Thus, in reviewing these data it can be seen that there are paints available capable of resisting attack by most agricultural formulations. Latex Penikote is such a paint.

Increased life of spray and dusting equipment is obtained through the cooperative efforts of all concerned with the problem. This article illustrates some of the effort put forth by the chemical manufacturers to lengthen equipment life.★★

References:

(1) Butler, B. J. *Progress Report to Pesticide and Application Equipment Committee.*
(2) *Abstracts of Papers,* 125th Meeting, American Chemical Society.
(3) Kelly, J. A., *Down to Earth,* a publication of the Dow Chemical Company.
(4) Black, D. T., *Progress Report No. 2 to Pesticide and Application Equipment Committee.*

TABLE II (Continued)

Test Solutions and Concentration	1. Styronated Black #100-A-532	2. #360 Latex Penikote	3. Petrolex	4. Linetite	5. Chlorinated Rubber	6. Tropical Orange	7. #60-5079 Styronated Green	8. Aluminum (Varnish-type)
mil thickness	4.3-4.8	3.5-3.7	2.3-2.5	-----	-----	3.0-3.1	1.9-2.1	-----
MCP								
Alkanolamine salt formulation 4# A. eq. per gal. undiluted	C	A	A	A	A	B	C	B
Alkanolamine salt formulation 4# A. eq/gal. 1 gal/20 gal. water	B	A	C	A	A	B	B	B
DNOSBP								
Alkanolamine salt formulation 3# active per gal. undiluted	C	B	A	A	A	B	C	B
Alkanolamine salt formulation 3# active/gal 1 gal/20 gal. water	B	A	A	A	A	—	—	—
PENTACHLOROPHENOL								
6% Pentachlorophenol in aromatic oil-undiluted	A	A	B	A	B	—	—	—
40% Pentachlorophenol concentrate-undiluted	C	B	A	C	C	B	C	B
40% Pentachlorophenol conc. + 86 gals. water 4 gals + 10 gal kerosene	B	A	A	A	A	—	—	—
SODIUM TCA								
Solution cont'g 6# sodium TCA 90%/gal. undiluted	B	B	A	A	B	—	—	—
Solution cont'g 1# sodium TCA 90%/gal. undiluted	B	A	A	A	B	—	—	—
MISCELLANEOUS								
Kerosene-undiluted	A	A	A	A	A	—	—	—
Midland City water	A	A	A	A	A	—	—	—
Mill machinery fumigant cont'g 20% wt. ethylene dibromide, 20% wt. ethylene dichloride and 60% wt. carbon tetrachloride. (Test panels exposed 25 days in liquid and vapor phases)	C	A	C	C	C	—	—	—

KEY: A—No effect.
B—Slight effect—area of treatment evident, slight streaking of surface.
C—Serious effect. This could be a wet sticky surface, crackled effect, blistering or peeling of painted surface.
See Figure 2 for typical ratings.

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Disking wheat stubble at the California Experiment Station shown in foreground.

CALIFORNIA STATION

(*Continued from Page 46*)

Hodgson. Here the rootstock factor in orange tree quick decline was discovered. Here also, a method was found to prolong greatly the storage life of citrus fruit and avocados by reducing the oxygen in the storage atmosphere, and by adding carbon dioxide to it.

The California Agricultural Experiment Station carries a particularly heavy load of research projects on crops which are grown in the United States and only in a few areas outside of California, such as avocado, artichokes, grapes, olives, nuts, citrus, etc.

As was inevitable, the history of the experiment station, which was initiated in 1875, is closely linked with the agriculture of the state whose annual farm income sometimes reaches 2½ billion dollars. Besides carrying on investigations at the regular stations, some 8,000 research plots, all over the state, are at the disposal of the Experiment Station, in cooperation with the extension service.

•

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PLANT NUTRIENTS

(*Continued from Page 38*)

trients will have to be applied to all soils.

Table 1 presents an estimate of the current plant requirements for heavy metals expressed in terms of annual crop contents of the various elements. Even when allowance is made for the fact that not more than a third of the tonnage listed in column 3 of the table is actually removed from the soil, we are still losing appreciable amounts of these nutrients annually.

The estimates of heavy metal consumption as fertilizer, presented in column 4 of table 1, are taken primarily from Lowe's tables as published in the final issue of National Fertilizer Review for 1953. The estimates for copper, iron, manganese and zinc are for 1952. The estimate for molybdenum represents 1954 consumption, most of which was used on citrus in Florida.

A comparison of the annual crop content of copper with the amount applied brings out an interesting

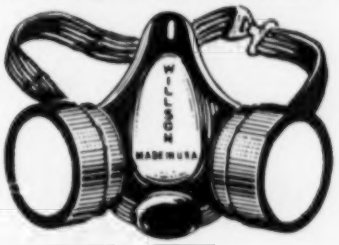
TABLE 1

Estimated Annual Heavy Metal Content of All U. S. Crops

Heavy Metal	Avg. Plant Content	Annual Crop Content*	Applied Annually
	P.P.M.	TONS	TONS
Cu	10	8,000	4,475
Fe	200	160,000	201
Mn	60	48,000	3,650
Mo	1	800	3
Zn	30	24,000	2,084

* Estimated on basis of 400,000,000 acres producing 2 tons dry material on each acre.

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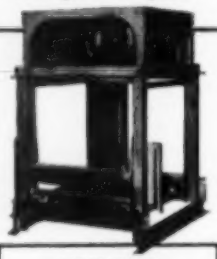
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point. Although less than one per cent of acreage in the United States is receiving applied copper at present, the total tonnage applied is more than half the amount required by crops growing on all U.S. land. This discrepancy is great and unfortunately we shall never be able to correct it entirely. Even a dilute spray, containing 4 pounds of copper sulfate to 100 gallons of water, will supply 25 times as much copper to the acre as is required by the average crop. The same is true for the other heavy metals and this means that the tonnage in column 4 of table 1 will within a few years surpass the corresponding estimates of crop requirements as listed in column 3. The disparity between the amount of a metal applied and the amount plants require may be narrowed by the use of foliar sprays or by soil applications of complexing agents such as the chelates.

TABLE 2
Sources of Information on Heavy Metal Deficiencies

Ala.—J. I. Wear
Ark.—D. A. Hinkle
Ariz.—W. T. McGeorge
Calif.—D. S. Mikkelsen
Conn.—B. A. Brown, E. J. Rubins
Colo.—R. S. Whitney
Del.—L. J. Cotnoir
Fla.—C. D. Leonard
Ga.—J. E. Giddens
Idaho—G. D. Baker
Ill.—S. W. Melsted
Ind.—A. J. Ohlrogge
Iowa—J. Pesek
Kan.—R. V. Olson
Ky.—W. A. Seay
La.—W. J. Peevy
Me.—R. A. Struchtemeyer
Md.—F. L. Bentz
Mass.—W. G. Colby
Mich.—R. Lucas
Minn.—R. A. Briggs
Miss.—W. B. Andrews
Mont.—J. A. Asleson
Mo.—G. E. Smith
Neb.—L. Chesnin
Nev.—V. E. Spencer
N. H.—R. S. Donahue
N. J.—E. R. Purvis, N. F. Childers
N. M.—J. C. Overpeck
N. Y.—C. B. Sayre
N. C.—H. J. Evans
N. D.—J. E. McClelland
Ohio—F. S. Howlett, W. N. Brown
Okla.—F. B. Cross
Ore.—R. K. Kirsch
Pa.—C. B. Smith
R. I.—J. B. Smith
S. C.—W. R. Paden
S. D.—S. A. McCrory
Tenn.—B. S. Pickett
Tex.—J. F. Fudge
Utah—R. E. Warnock
Va.—W. P. Judkins, E. R. Purvis
Vt.—G. M. Wood
Wash.—C. B. Harston
W.Va.—G. G. Pohlman
Wis.—K. C. Berger
Wyo.—J. L. Mellor

IRON CHELATES

(*Continued from Page 49*)

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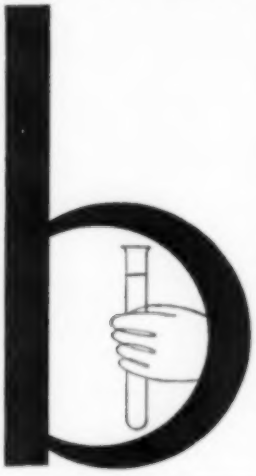
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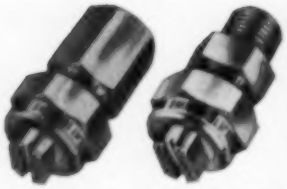
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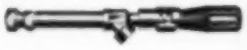
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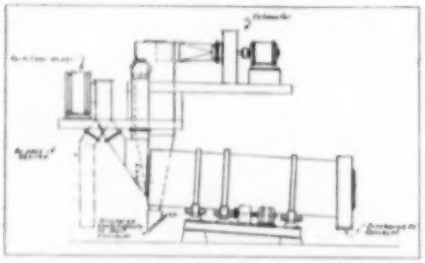
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FOA PROGRAM

(*Continued from Page 55*)

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(*Continued from Page 69*)

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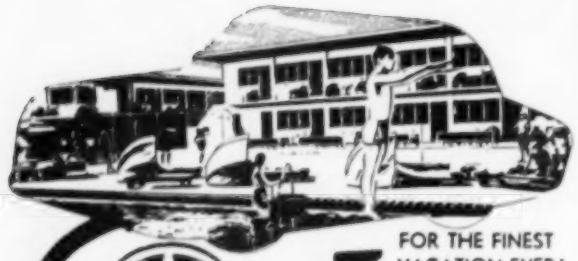
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(SEAL) Judith Simmons

(My commission expires March 30, 1956.)

Tolerances established under Sec. 406 — (Continued from Page 60)

Pesticide	Tolerance in p.p.m.	Fruits and vegetables to which tolerance applies
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TDE	7	Apples, pears, quinces, apricots, cherries, citrus fruits, grapes, peaches, nectarines, raspberries, blackberries, loganberries, strawberries, beans, black-eyede peas, broccoli, cabbage, brussels sprouts, kohlrabi, cauliflower, carrots, corn, eggplants, peas, peppers spinach, tomatoes
Toxaphene	7	Apples, pears, quinces, apricots, citrus fruits, peaches, nectarines, raspberries, blackberries, loganberries, strawberries, beans, black-eyed peas, broccoli, cabbage, brussels sprouts, kohlrabi, cauliflower, carrots, celery, corn, cucumbers, eggplants, lettuce, okra, onions, parsnips, peas, radishes, tomatoes
Zineb	7	Apples, pears, quinces, cherries, cranberries, gooseberries, grapes, peaches, nectarines, raspberries, blackberries, loganberries, strawberries, beans, black-eyed peas, beets, broccoli, cabbage, brussels sprouts, kohlrabi, cauliflower, carrots, celery, cucumbers, eggplants, endive, escarole, kale, collards, lettuce, melons, mushrooms, onions, parsley, peanuts, peas, peppers, pumpkins, radishes, salsify, squash, Swiss chard, tomatoes, turnips
Ziram	7	Apples, pears, quinces, apricots, blueberries (huckleberries), cherries, cranberries, gooseberries, grapes, peaches, nectarines, raspberries, blackberries, loganberries, beans, black-eyed peas, beets, broccoli, cabbage, brussels sprouts, kohlrabi, cauliflower, carrots, celery, cucumbers, eggplants, kale, collards, lettuce, melons, onions, parsnips, peas, peppers, pumpkins, radishes, squash, tomatoes, turnips



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Dalton - - - Georgia

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Tale Ends



A scale model exhibit (at right), showing the use of aerial equipment in agriculture, was on display at the Indiana State Fair. A mechanically controlled model aeroplane traversed a series of crops in realistic fashion, attracting considerable attention from professional and "sidewalk" aerial applicators. Our thanks to Prof. I. J. Davis of Purdue University for sending the photo to us.



Take a Look . . .

TAKE a look at your advertising picture. Are you buying a lot of waste circulation at fancy rates? Or are you shooting direct at fields you do and can sell with concentrated pay-dirt circulation? Now, if it be the field of agricultural chemicals, take a close look at

AGRICULTURAL CHEMICALS

175 FIFTH AVE. NEW YORK 10, N. Y.

Member Audit Bureau of Circulations

Going under the well-founded assumption that everyone reads a post card (including the mailman), California Spray Chemical Corp. is using special full color glossy picture post cards to show the advantages of using its Orthocide to protect peaches, cherries, etc. Some punster no doubt will send one to the folks back home with this message: "Having a wonderful time, wish you were here."

AC

The fertilizer and pesticide control officials, meeting in Washington last month, had more than their usual share of problems, what with Hurricane Hazel. She put on such a show that Dr. Philip J. Spear, of the National Pest Control Assn., was delayed three hours in making his speech. Then she had the audacity to break two windows in the trade association suite in the Shoreham. No casualities were reported, however.

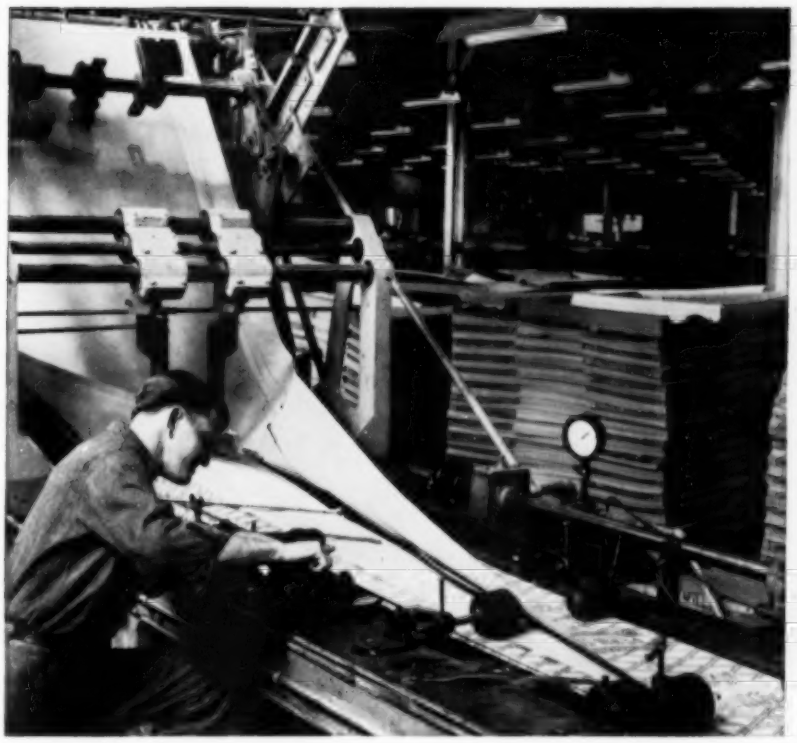
AC

The Association of Economic Poisons Control Officials took a much needed step at its convention in changing its name to Association of American Pesticide Control Officials. The new name should make clearer the job performed by the men.

AC

The annual NFA and APFC banquets given in honor of the fertilizer control officials are always welcome. Lot's of good food and entertainment, and no speeches.

How Bemis makes GOOD multiwall bags for you



Herman Johnson, who is in charge of this big tuber at the Bemis Multiwall Plant in Peoria, joined Bemis in the tubing department nine years ago and worked up to his present capacity. His job is one of the most important in a multiwall plant.

Experienced Hands Run Our Tubers!

Tubers—the big machines that fold and paste the multiple kraft plies—are the heart of multiwall bag making. Running, they look pretty automatic. But you don't learn to run a tuber by reading an instruction manual. It takes long experience, knowing eyes, deft hands, to keep the plies properly nested and paste properly applied . . . and to control the many other factors that affect the performance of the finished bag. We've been making multiwalls for twenty-seven years . . . so there's plenty of bag-making experience in our twelve multiwall plants strategically located coast to coast.

Bemis

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St. Paul Pioneer Press
Oldest Newspaper In Minnesota
STATE BATTLES ARMY WORMS
Hoppers – Grass, Leaf – Also Pose Insect Threat Here
Boll Weevil War About To Start, Checks Indicate
By BOB CHESNUTT
Extension Service Editor
AUBURN — The annual battle in the old war against boll weevils seems about ready to start.
At stake in the fight is some $0 million — the average yearly
Toxaphene Insecticides Used To Battle Invasion Of Cutworms Over South
OFFICIAL REPORTS INFESTATION
Increased Fleahopper Activity Cited In Lubbock Area Fields
Poison Flown To Stricken West Area
Millions Lost; Anderson Calls Guard To Help
Corn Borer Next Insect Menace
Horn Flies Can Be Controlled Easily
By WADE KENNEDY
Ashland County Agent
Webworm Attacks Corn; Pests Prove Hazard to Crops
By Warren B.
Associate Co
COUNTY AGENT SAYS TOXAPHENE IS GOOD HOPPER CONTROLLER
According to the reports of dealers, one and one-half pounds of Toxaphene per acre sprayed on green vegetation where grasshoppers are parking has given good control.
Armyworms Strike Area Crops, Trees
Governor Sets Emergency; Seek Toxaphene, DDT
Cutworms Damage Alfalfa Fields
Prevention Is Best Remedy For Chiggers
Powders Will Repel The Mites; Lawns Can Be Sprayed
The best chigger remedy is pre
Thrip Control Urged In Yazoo Cotton Fields
Worms Strip a Bean Field Overnight
About 10 Acres of Young Crop Eaten in Bone Earth; Were on 'Hoppers, Too.
Webworms, now adding to the troubles of farmers of this section, practically cleaned
Fruitworm Can Ruin Tomatoes
Annual Battle Against Boll Weevil Beginning
By BOB CHESNUTT
AUBURN—The annual battle in the old war against boll weevils seems about ready to start.
At stake in the fight to some $80,000,000—the average yearly toll taken by Alabama cotton's worst enemy.
Although no one can predict how numerous boll weevils will be this year, a report given here today by
line in Alabama this year include (1) aldrin, two and one-half per cent, (2) BHC, three per cent gamma, (3) dieldrin, one and one-half per cent, (4) heptachlor, two and 50 per cent, or (5) toxaphene. These materials except toxaphene and endrin must have five per cent DDT added to them to control boll
Army Worm Problem Gets More Serious
The infestation of the Armyworm has become serious in Allegany County, according to County Agricultural Agent Blist. Nearly every area of the county has reported some infestation, he said.
The agent said that the army
Kill Those Hoppers, Missouri Urges
COLUMBIA, MO. — Grasshoppers are laying in starting in the southern portions of the state and will increase maternally and spread over the entire state during the next several weeks. Each female, incidentally, will lay an average of 250 to 300 EGGS. With the numbers of hoppers we now have, our prospects for next year are cas-
Weevil Infestation On Increase in South Caroline
CLEMSON, S. C.—Recent reports from over the state show a sharp increase in boll weevil infestation in many cotton fields. These reports indicate an average infestation increase from 6½ to 9% in fields where insecticides have been applied and from 16% to 26% in fields where no
Applications have been made
Cotton prospects are
Armyworm Found On Avery Farm In Winchester
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